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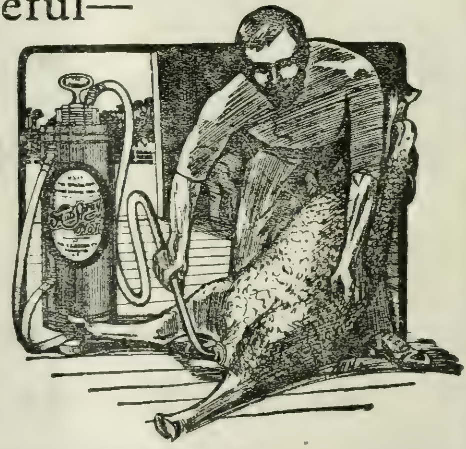

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2nd January, 1919.

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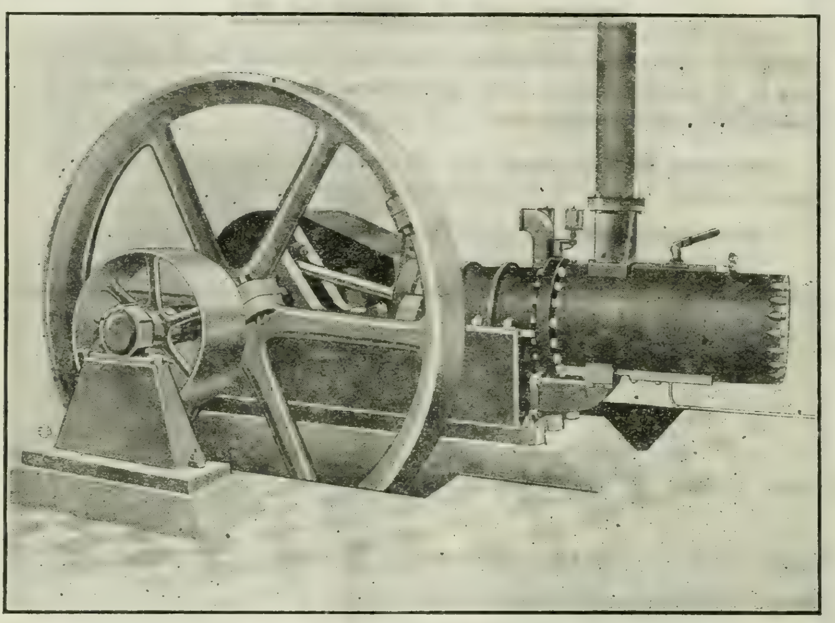

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AND AT MELBOURNE AND BRISBANE.

VOL. XXX PART 1. JANUARY 2, 1919.

Agricultural Gazette of New South Wales.

Jersey Cattle at Hawkesbury Agricultural College.

P. WALLER, H.D.D., Acting Dairy Instructor.

ONLY two breeds of dairy cattle are kept at the College, viz., the Jersey to represent the dairy type, whilst the popular demand for a dual-purpose animal is met by the Red Polls.

The Jersey is undoubtedly the most popular purely dairy type of cow, and its influence upon our dairy herds is probably more pronounced than that of any other breed. Wherever we find a grade dairy herd of outstanding merit it is generally found that the Jersey has been largely responsible for the quality.

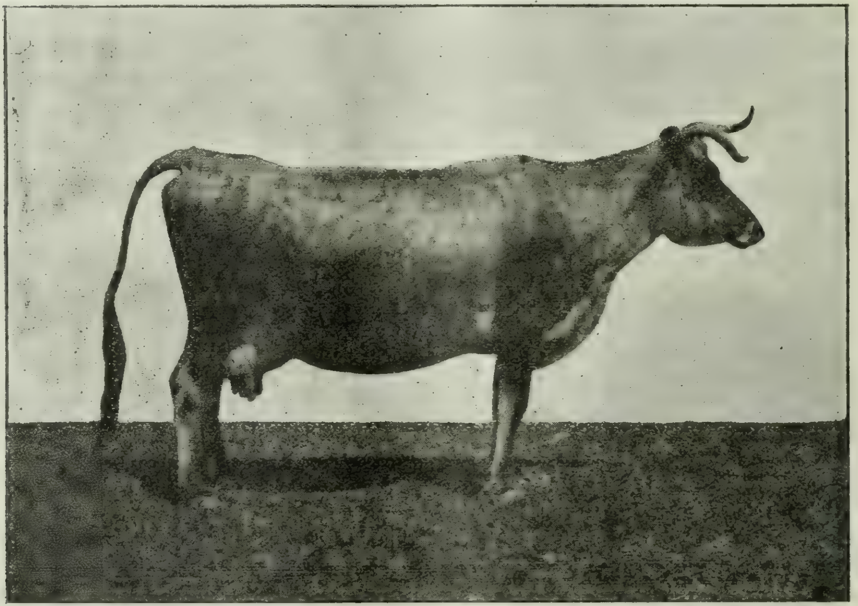
General View of the Herd

It is only to be expected that this breed would possess deep milking qualities because they have been maintained solely on dairy lines for nearly two centuries in their native island home, a small but very fertile tract of country noted for its small holdings and high land rents. Under these conditions Jersey cattle proved most suitable, and the greatest care was taken to maintain the purity of the breed and also to develop the milking qualities. To ensure this object the Government of the Island of Jersey passed a law in 1798 forbidding the importation of cattle except such as were needed for slaughter.

In consequence of this we have the modern Jersey cow, famed for her butter production only; she can probably produce more butter for the food she consumes than any other cow.

The breed is adaptable to a wide range of conditions, varying from the cool tablelands to the hot North Coast districts. It is also popular on the South Coast, while at the College they give particularly good yields.

A good type of Jersey cow is the model of true dairy conformation, having the pronounced wedge shape, an immense barrel for her size, a well-developed udder carried well upward at the rear, as well as running well forward towards the navel; thighs flat, and incurving from the tail setting. Her neck should be fine, long, and free from fleshiness, with a head of medium size, having a dished face, wide between the eyes and narrow between the horns. She should have a straight back, with hips broad and level, the tail being long and fine.



Silvermaid.

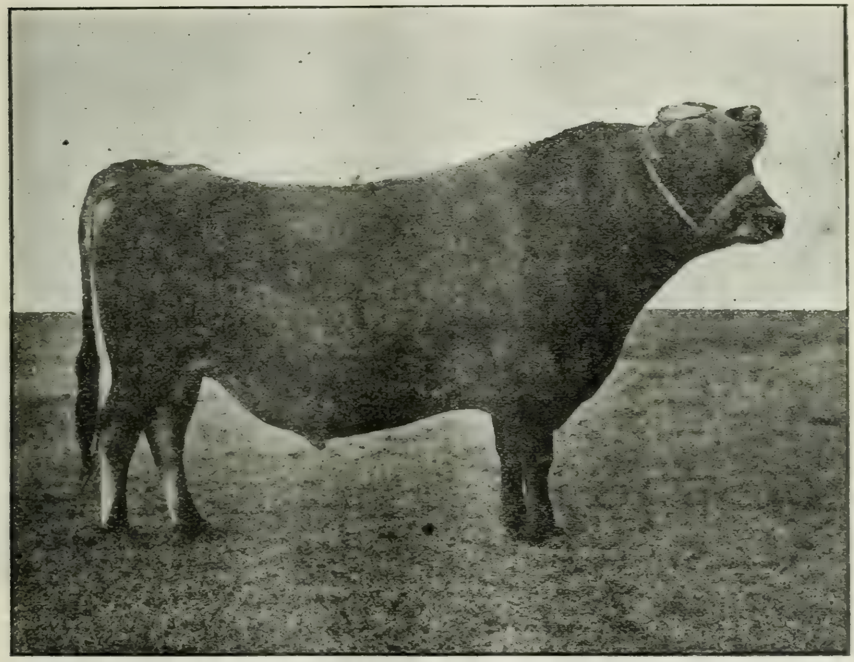
Taken when 16 years of age. She had a calf every year, and was milked for twelve seasons.

Jerseys carry no surplus flesh when in milk; they are persistent milkers, and are hard to dry off.

We find that some families are shy breeders, and are difficult to get in calf; these are usually coarse in type, and arrangements should be made to cull them from the herd.

Jersey cattle were once regarded as being delicate. Many people conceived the idea that they were susceptible to tuberculosis, this idea being largely due to prejudice, because of the refined, deer-like appearance of the females. Experience has proved, however, that the mature animals are no more subject to disease than any other breed; in fact, tuberculosis is said to be unknown amongst the Jerseys in their native land. At the College the writer can vouch for the fact that not one case has been observed during the past four and a half years; notwithstanding that dozens of animals have been submitted to the tuberculin test, not one has reacted.

It is admitted that the calves are somewhat more difficult to rear than those of other breeds, and consequently a little more care must be bestowed upon them during their first month.



Lord Silvermine 4th of Banyule.

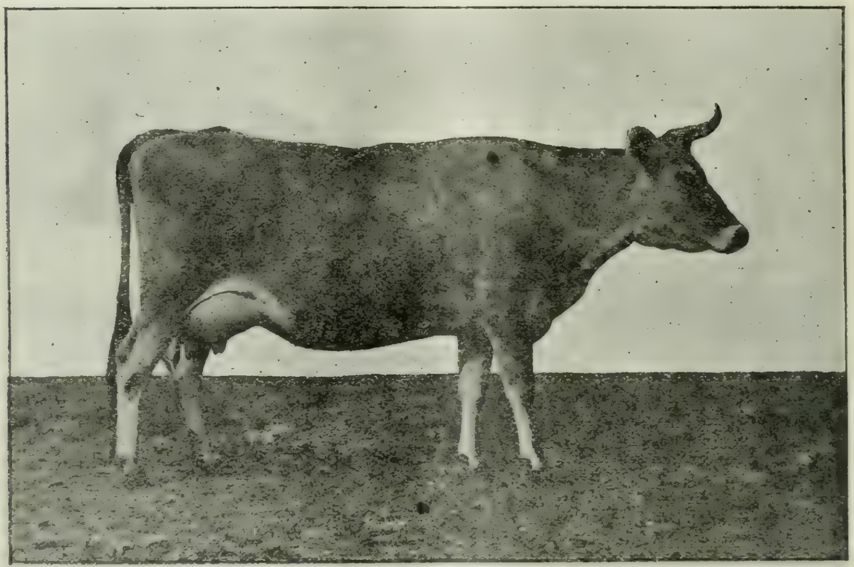
Jerseys are noted for their early maturity; some of our heifers reached the period of œstrum before they attained the age of three months. The males are also more forward than most other breeds.

Despite the fact that they mature early, they are persistent milkers to a great age; an illustration is given on page 2 of that fine old cow "Silvermaid" when sixteen years of age. She had a calf regularly every year, and was milked for twelve seasons. Considering the climatic and soil conditions at the College, this is convincing evidence of her stamina and constitution. We also have at the College "Hawthorn," aged fourteen years, who is still a handsome cow.

There is a tendency on the part of some breeders to run the Jersey too fine in type, which results in a lack of constitution and assimilative power, causing a diminished milk yield.

It is obvious that a cow must have the capacity to assimilate a large quantity of food if she is to be a heavy milk-producer; this demands that she must have a large, deep barrel, with well-sprung ribs, to accommodate a capacious digestive system and healthy heart and lungs.

The dairy farmer naturally looks at the practical side of the question, and prefers the cow which produces heavy yields of rich milk rather than the animal whose chief recommendation is beauty of outline.



Wagga Jasmine.

Produced 10,746 lb. milk, containing 729·3 lb. butter, in 365 days.

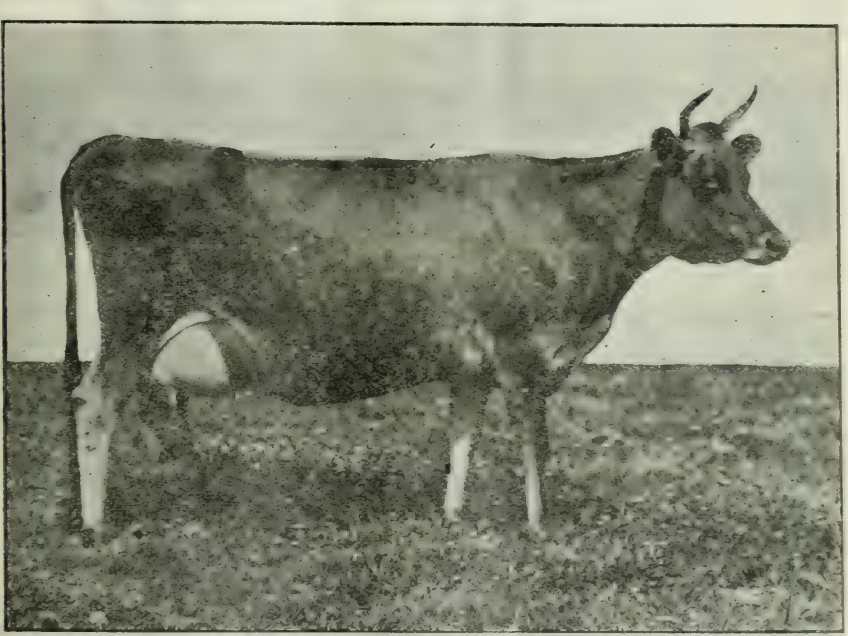
Realising this fact, our first consideration at the College is to maintain a herd noted for heavy milk production and strong constitution.

These points are decided on by systematically weighing and testing the milk of each cow and then rejecting all those animals which do not reach a high standard of yield and conformation. By this means purchasers of bulls from this herd may be assured of getting sires which will produce heifers of pronounced milking characteristics.

Three bulls are in use here for the correct working of our different lines of blood. Pride of place is given to Christmas Fox (imp.), who has sired so many very heavy butter producers. He is by Silver Fox (10097 E.J.H.B.) from Malvoisie, who was a noted prize-winner in England, in milk and butter and open inspection classes. In 1910 at the Royal Counties Show at Winchester she yielded 49 lb. of milk, producing 2 lb. 6¼ oz. butter, in twenty-four hours 165 days after calving.

Another bull in use at the College is Lord Silvermine 4th of Banyule, an animal of beautiful proportion and substance; he is descended from heavy producing stock. His dam, Silvermine 4th (716), yielded 7,592 lb. milk, containing 461·5 lb. butter, in 273 days, whilst his grand-dam produced 3 lb. 2 oz. butter in twenty-four hours in a public test, and was four times champion of Melbourne Royal Agricultural Show.

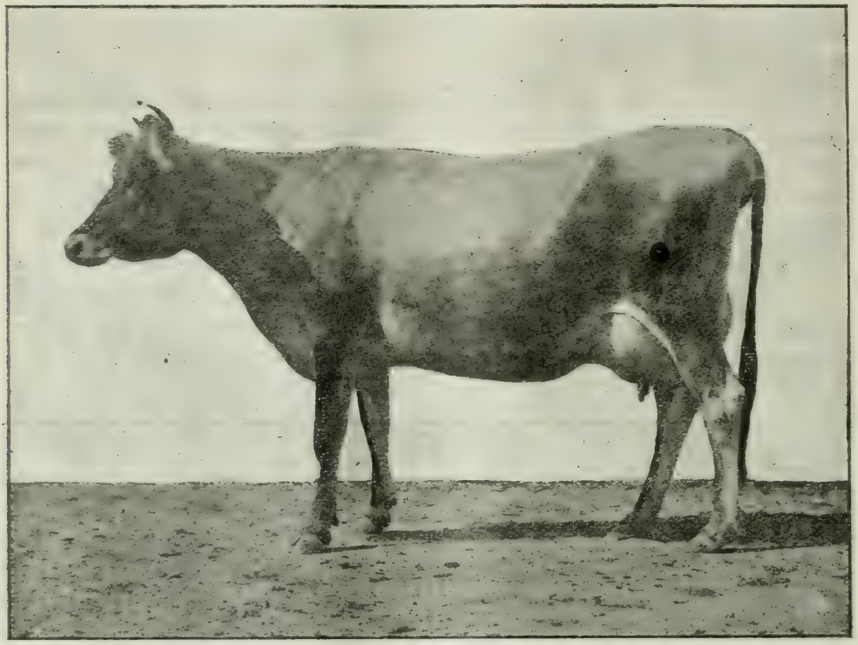
Lord Silvermine 4th of Banyule gives every promise of begetting heifers which will be heavy producers; he should be a splendid bull for mating with the Christmas Fox heifers.



Glory Quayle.

Produced 8,862 lb. milk, containing 495·4 lb. butter, in 273 days.

Leda's Retford Pride is the third bull in use here; he has several heifers in milk already, which are putting up highly satisfactory yields for 2-year-olds, viz., Wagga Mab and Wagga Modesty. Leda's Retford Pride is by Dinah's Lad (400) from Leda's Angel, by the famous Black Antimony (imp.) from Leda's Snowdrop, who was celebrated both as a show cow and as a producer, being first champion at Sydney Royal Agricultural Show in 1909–10–11–12; she yielded 11,886 lb. milk, containing 796·75 lb. butter, in 365 days.



Bluebell

Wagga Adeline.

JERSEY CATTLE AT HAWKESBURY AGRICULTURAL COLLEGE.

The conditions at the College are not conducive to heavy milk and butter yields, the soil being extremely poor and lacking in essential mineral salts; the pastures are consequently of low feeding value, and the crops produced on this soil and fed to the cows do not possess nearly the same milk-producing quality as those grown on richer soils.

In addition to this fact we have visitors about the bails almost every day, as well as large numbers of students, many of whom are changed continually in the routine of farm work. All this means somewhat unsettled conditions, which tend to disturb the highly-strung nervous system which is characteristic of very heavy producers.

However, some fine results were recorded during the past year. Wagga Jasmine produced 10,746 lb. milk, containing 729·3 lb. butter, in 365 days. This cow began with two weak quarters of her udder, and was in rather low condition, which makes her yield more creditable. On the last day tested she produced 24 lb. milk, equal to 1·92 lb. butter.

Wagga Nuta yielded 9,303 lb. milk, containing 609·9 lb. butter, during the same period.

Glory Quayle produced 8,862 lb. milk, containing 495·4 lb. butter, in 273 days. This cow is only on her second calf, and would have done very much better except for an attack of milk fever, which appeared to affect her production of milk for about three months afterwards. She should give a big record when two or three years older.

Feeding.

The pastures at the College have to be supplemented with stored fodders and concentrates, and the quantity of these supplied depends upon the quality and quantity of the paddock feed available. Some idea of the kinds and amounts supplied for the purpose will be found in the following summary, which indicates the average daily ration per cow :—

August, 1917, 40 lb. silage, 8 lb. lucerne, 1 lb. oilcake, 2 lb. bran.
September, 20 lb. silage, 5 lb. lucerne, 1 lb. oilcake, 2 lb. bran.
October, 8 lb. lucerne, 1 lb. oilcake, 1 lb. bran, 8 lb. wheaten chaff.
November, 8 lb. lucerne, 3 lb. bran, 8 lb. oaten chaff.
December, 8 lb. lucerne, 3 lb. bran, 8 lb. oaten chaff.
January, 1918, 8 lb. lucerne, 3 lb. bran, 8 lb. oaten chaff.
February, 6 lb. paspalum hay, 8 lb. lucerne, 3 lb. bran.
March, April, and first half of May, 20 lb. green maize, 10 lb. lucerne, 4 lb. bran.
Last half of May and throughout June, 40 lb. silage, 10 lb. lucerne, 3 lb. bran.
July, 40 lb. silage, 10 lb. lucerne, 4 lb. bran.
August, 40 lb. silage, 8 lb. lucerne, 1½ lb. coconut meal, 3 lb. bran.
September, 30 lb. silage, 5 lb. lucerne, 1½ lb. coconut meal, 2 lb. bran.
October, 40 lb. silage, 5 lb. lucerne, 1½ lb. coconut meal, 2 lb. bran.

YIELDS of Jersey Cows at Hawkesbury Agricultural College.

Cow's Name.	Milk Produced.	Butter.	Lactation Period.	Age.	Produced on last day of Test.	
					Milk.	Butter.
	lb.	lb.	days.	yrs.	lb.	lb.
Wagga Jasmine (2779)	10,749	729·48	365	6	24	1·92
Wagga Nuta (2782)	9,303	610·00	365	7	20	1·57
Glory Quayle	8,952	495·4	273	4	25	1·56
Blue Bell	6,427	413·40	273	4	14½	1·02
Comfort	5,790	365·5	273	4	10½	·81
Bella	5,908	353·76	273	3	13	·87
Rosette's Heiress...	5,775	366·5	273	4	16	1·22
*Belle	6,784	391·30	213	7	26½	1·76
*Retford Ella	6,064	355·00	243	6	19½	1·19
Retford Minnie	7,248	395·00	273	5	17½	1·03
Wagga Ceres	5,700	322·8	273	7	14	·77
Lady Colleen 2nd	5,810	367·5	273	7	15	·84
Wagga Adeline	6,758	434·6	273	8	16½	·96
Heath	4,462	307·30	273	3	11½	·80
*Adeline of Wollongbar	5,064	331·50	243	5	18½	1·3
Trenton's Beauty	6,522	384·00	273	4	15½	·91
Terrara	4,030	277·56	273	3	13	1·08
Colleen Bawn of Cowra	4,511	263·1	273	2	13	·66
Lady Colleen 4th	5,576	352·19	273	2	17	1·25
Isabella	4,903	314·40	273	3	13	·86
Adeline of Richmond	5,013	268·3	273	2	18	·95
Wagga Lena	5,634†	335·4	273	8	15½	·87
Wagga Fancy *	5,662	346·56	273	5	17	·99
Viola	5,119	338·00	273	4	15	1·21
*Maid of Athens (549)	4,441	332·90	213	11	14½	1·15
Lady Newman (2176)	4,524	300·72	273	6	11	·97
Pride of Berry	3,627	251·00	273	3	7	·57
Rum Omelette IV.	4,062	283·08	273	3	11	·75
Rosy Dawn 6th (2579)	4,147	311·00	273	10	......	......
Fawn IV. (1969)	6,239	350·00	273	10	......	......
Retford Gold	3,918	265·60	273	2	......	......
Retford May (2559)	4,232	316·00	273	3	......	.....
Lady Belle...	4,242	271·62	273	3	12	·89
Culcairn 3rd	4,626	309·06	273	3	14½	1·11
Lally Optician 2nd	3,550	258·72	273	3	10½	·79
Lady New of Richmond... ...	3,858	236·64	273	2	9	·66
Lady Colleen 3rd	5,533	309·56	273	4	12	·74

* Test still progressing. † Three teats only.

Lady Colleen 2nd and Lady Colleen 3rd

Wagga Growing-crop Competition.

[The Murrumbidgee Pastoral and Agricultural Association, Wagga, again held a growing-crop competition, and, with the approval of the Minister of Agriculture, Mr. H. C. Stening, Inspector of Agriculture, acted as judge. The following extracts from the report furnished to the President and Committee of the Association by Mr. Stening are published for general information.—ED.]

THE season in the Wagga district has been anything but favourable for cereal production. The rainfall recorded at the Wagga Post Office during the period from the 1st of April to the end of October was 1,004 points, which is over 4 inches below the average for this period. If this precipitation had been more evenly distributed there would have been little ground for complaint, but the great under-average period was during the critical spring months, the total rains registered during September and October being more than 3 inches below average. In consequence, many crops which promised very satisfactory yields early in September have been considerably depreciated, the exceptions being crops sown reasonably early on well-fallowed land.

It is largely due to the deterioration of crops owing to the lack of moisture during the spring that the entries in the competition this year were not so large as usual. They were fifteen entries in all, of which four were withdrawn prior to the time of judging.

The total area inspected was 3,053 acres, in farms ranging from 170 to 560 acres. As hay-cutting had been commenced by Messrs. T. V. and R. L. Brunskill, the crops on this farm were judged on 25th October. The judging in general did not commence until 5th November, and was completed on 8th November.

In tabulated form are set out the points awarded to each competitor, together with the particulars of the area, cultivation methods, and rainfall.

The rainfall records were available at only three farms, and the registrations at the Uranquinty Public School are taken to represent the rainfall at Mr. Lewington's farm, which is in the vicinity. The records given in each case cover the period from the 1st of May to the end of October, and are therefore capable of comparison. It will be noted that the crops at Uranquinty had the advantage of at least 123 points more rain during the growing period than those grown on the north side of the Murrumbidgee.

CONDITIONS.

The following are the conditions governing the competition for first prize of £10 10s., and second prize of £5 5s., for the best farm of growing crops :—

1. Crops entered to be not less than 150 acres or more than 1,000 acres. Total area of holding not to exceed 5,000 acres, and situated not more than 30 miles from Wagga Wagga. The whole area of land wheresoever situated, and whether on land owned by exhibitor, or land leased by exhibitor, or on land farmed on shares by exhibitor, shall be exhibited.

2. Any person who possesses an area of crop outside the 30 miles radius in addition to an area within the 30 miles radius, shall not be eligible to compete.

3. Crops to be judged from a grain-yielding standpoint only.

4. Each competitor shall supply the following particulars with his entry :—Total area of holding or holdings (acres). Total area of crop (acres). Date of sowing. Quantity of seed sown per acre. Quantity of manure applied per acre. Number of crops grown previously. Area sown with wheat (acres). Name of varieties. Area sown with oats. Area sown with barley. Method of cultivation. Approximate rainfall during growing period.

5. Every competitor must furnish the Secretary with a description of the nearest road to reach his holding, also state distance from town. Competitor must also accompany the judge whilst inspecting his crop.

Additional Prizes.—(A) Best 100 acres of wheat, to be harvested for grain and to be grown on fallowed land, prize £5. (B) Best 100 acres of wheat grown for hay, prize £5.

The prize-winners are as follows :—

Best farm of growing crops :—A. Lewington, 139½ points, 1 ; A. E. Armstrong, 138 points, 2.

Best 100 acres of wheat, to be harvested for grain, and to be grown on fallowed land : J. L. Baker, 1.

Best 100 acres of wheat, grown for hay : W. J. Dennis, 1.

Much credit is due to Mr. Lewington in gaining the first prize with the largest area entered by any of the competitors, viz., 560 acres. He has been a competitor in these competitions for several years, and, although consistently scoring well, has usually been beaten by competitors with a much smaller area of crops. In 1916 he gained second place, and in 1915 and 1917 was placed third. In addition to his much larger area of crops, he was at a further disadvantage by reason of the fact that his land has been under cultivation for a considerable number of years. It speaks volumes for the good farming methods practised that this land should produce such excellent crops under unfavourable conditions, and should be so free from weed-growth. The whole 560 acres was fallowed in July and August, and the fallow was well cultivated. The sowings were made from the 1st of April to the end of May at the rate of 60 lb. of seed and 50 lb. of superphosphate per acre. Algerian oats were sown on 240 acres, and the varieties of wheat grown on the rest of the area were Yandilla King, College Purple, Warden, and Red Lammas, all of which had produced good crops of both grain and hay. A portion of the oat crop was rather uneven, owing to sorrel inhibiting the growth of the crop in small patches.

Mr. A. E. Armstrong secures second prize with good crops of Warden, Yandilla King, and Red Straw, which were all grown on fallowed land, and were the acme of cleanliness and very true to type.

The prize for the best 100 acres of wheat grown for grain on fallowed land was won by Mr. J. L. Baker with a crop composed of several varieties, viz., Yandilla King, Penny, Major, Lotz, and Improved Dart's Imperial, which promised an average of 27 bushels per acre, and, in fact, from the appearance of the crop it was difficult to realise that there had been an almost entire absence of rain for more than two months. The whole was very true to type, showing that care had been taken in the choice of seed and avoidance of mixture with other varieties. In spite of the fact that the land had been in cultivation for over thirty years, the crops were very clean, which, together with the superiority of the crops, reflects the excellence of the cultivation methods adopted.

Mr. W. J. Dennis gains the prize for the best 100 acres grown for hay with a crop of Warden grown on well-fallowed land, and sown with 60 lb. seed per acre and 75 lb. No. 10 Special Fertiliser. For comparative purposes, a block was manured with an equal quantity of ordinary superphosphate, and there was no difference discernible in the appearance of the crops. The crop is very even, possessing little flag, and is remarkably clean and free from undergrowth. It is estimated to yield about 34 cwt. of hay per acre, which should cut a prime market sample of chaff.

Cultivation Methods.

It will be noted that out of 3,053 acres of crop inspected, 2,833 acres were grown on fallowed land. This is a distinct improvement on previous years, and serves to show not only that the only crops which under the adverse conditions were sufficiently satisfactory for competition were those which were the result of good farming methods, but also that with the decrease in area of land cropped with cereals is associated better farming. The reduction of the area under wheat during the past three years has been viewed with apprehension by many, but it will probably prove to be not altogether an unmixed evil. With the greater opportunity to give proper attention to the smaller areas under cultivation, it can be confidently anticipated that there will be a general improvement in cultural methods. If, in order to put the uncropped areas on the farms to profitable use, a sound system of mixed farming is adopted, combining sheep with wheat-growing, it can be safely predicted that there will be increased production and larger profits from our agricultural areas, and, furthermore, that the fertility of the land will be better maintained.

There is still much room for improvement in the methods adopted in fallowing. Firstly, as to the time of ploughing: The winter months are the best for the purpose of storing up moisture in the soil, since at this period the rainfall is good and the evaporation from the soil is low; therefore, as soon as seeding operations are concluded, every opportunity should be taken when the soil is in suitable condition to proceed with the fallowing, which, if possible, should be completed by the end of August. Later fallowing is done usually at the expense of soil moisture.

Again, too frequently the cultivation of the fallow in the early spring is neglected. It is a scientific fact that the greater the percentage of moisture in the soil the more rapidly is it evaporated. In the early spring the soil contains its maximum percentage of moisture and evaporating agencies have become active; therefore the spring cultivation is of the greatest importance in checking the evaporation of moisture from the soil, and neglect to perform same could easily spell the difference between success and failure; and even delay in creating a soil mulch at this period may result in serious loss of moisture by evaporation. It is surprising the saving of moisture that can be effected by even a slight cultivation with the harrows in the early spring.

DETAILS OF AWARDS, WAGGA GROWING-CROP COMPETITION, 1918.

Names and Addresses of Competitors.	Area of Crop.	Varieties.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Rainfall during growing period.	Number of Crops grown previously.	Apparent Yield.	Trueness to Type.	Freedom from defects and disease.	Evenness.	Cleanliness.	Cultivation.	Total.
	Ac.				lb.	lb.	Pts.		* Pts.	† Pts.	‡ Pts.	§ Pt.	‖ Pt.	¶ Pt.	Pts.
1. A. Lewington, "Texas Farm," Uranquinty.	560	Yandilla King, Warden, College Purple, Red Lammas. Algerian Oats.	Fallowed July and August, harrowed after ploughing; cultivated with spring-tooth in spring; disc-cultivated and harrowed before sowing; 180 acres were ploughed instead of disc-cultivated in February, to deal with thistles.	1st April to end May.	60	50	979	Very old land.	24½	19	19	18	29	30	139½
2. A. E. Armstrong, Gobbagombalin.	208	Warden, Yandilla King, Red Straw.	60 acres harrowed in March prior to fallowing; the whole fallowed August and September, harrowed in March, disced prior to sowing.	Early May ..	50 to 60	46	..	7	22	20	19	19	30	28	138
3. J. L. Baker, "Yarranvale," Mangain.	375	Federation, Hard Federation, Barоota Wonder, Canberra, Bomen, College Purple, Lotz, Turvey, Yandilla King, Major, Dart's Imperial, Penny, Improved Dart's Imperial, Guyra Oats, Sunrise Oats, Kinver Barley, Beardless Cape Barley.	340 acres fallowed July and August, and harrowed; disced and skim-ploughed before harvest; disced February and March; 90 acres disced again in April; 35 acres ploughed February; spring-toothed and skim-ploughed before sowing.	April 21st to May 18th.	50	56	855	Over 6	23½	18½	18½	19	28	29½	137
4. W. J. Dennis, "Havilah," Harefield.	170	Warden, Zealand ..	Fallowed July and August, and harrowed; cultivated before harvest; disced March and April.	May 6th to 1st week June.	50 to 60	75 lb. No. 10 special fertiliser.	856	7	20	20	19	19	29	30	137
5. W. F. Stone, "Springwood," Uranquinty.	220	Marshall's No. 3, Federation, Dart's Imperial, Currawa, Red Lammas.	Fallowed October and harrowed; scarified twice before harvest; scarified and harrowed before sowing.	Late May ..	60	45	..	Very old land.	21½	19	18	19	29	29	135½

Maximum Number of Points..

* 1 point for every 1 bushel wheat.
1 ,, 1½ ,, oats.
1 , 1¼ ,, barley.

† 20

‡ 20

§ 20

‖
1st crop .. 24
2nd ,, .. 25
3rd ,, .. 26
4th ,, .. 27
5th ,, .. 28
6th ,, .. 29
Over 6 crops.. 30

¶
1st crop .. 24
2nd ,, .. 25
3rd ,, .. 26
4th ,, .. 27
5th ,, .. 28
6th ,, .. 29
Over 6 crops.. 30

DETAILS OF AWARDS—*continued.*

Names and Addresses of Competitors.	Area of Crop.	Varieties.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Rainfall during growing period.	Number of Crops grown previously.	Apparent Yield. *	Trueness to Type. †	Freedom from defects and disease. ‡	Evenness. §	Cleanliness. ‖	Cultivation. ¶	Total.
	Ac.				lb.	lb.	Pts.		Pts.	Pts.	Pts.	Pt.	Pt.	Pt.	Pt.
6. A. Alleyn, "Fairview," Downside.	220	Federation, College Purple, Dart's Imperial, Improved Steinwedel, Algerian Oats.	150 acres fallowed August, harrowed in spring, disced and harrowed end of summer, scarified before and harrowed after sowing; 70 acs. stubble land ploughed March, harrowed before and after sowing.	Late April to early May.	Wheat 45 to 60, oats 40.	50 to 70	..	80 ac. 3rd crop; bal. over 6.	23	18	18	19	28	27	133
7. E. Field, "Wave Hill," Marrar.	240	Yandilla King, Federation, Warden, Firbank, Gold Return, Malting Barley.	200 acres fallowed August to October, disced March; 40 acres ploughed December, disced January, spring-toothed before sowing.	May	Wheat 45 to 50, barley 35	56	809	40 ac. 6th crop; bal. over 6.	22	19	18½	18½	26½	27½	132
8. A. Wooden, "Pine Grove," Marrar.	200	Federation, Yandilla King.	Fallowed mid-July to mid-August, portion harrowed; 150 acres skim-ploughed and balance disced before sowing, harrowed after drill.	Mid April to mid-May.	50	50	..	6th crop.	22	17	18½	18	27	28	130½
9. T. V. & R. L. Brunskill, "Thackwood," Lake Albert.	270	Federation, Zealand, Currawa, Algerian Oats, Golden Grain Barley.	Fallowed July and October, harrowed August, disced before harvest. Disced January, disced before sowing.	Early April to mid-May.	60	30 to 40 barley unmanured.	..	Very old land.	19	19	17½	18	28	29	130½
10. A. A. Wilson, "Lisgo," Old Junee.	400	Federation, Bomen, Yandilla King, Algerian Oats.	335 acres fallowed July and August, portion disced, portion ploughed, and balance spring-toothed January and February. Harrowed twice before sowing and harrowed after sowing. 110 acre crop harrowed July, 80 acres fed off and harrowed end July; 65 acres stubble land ploughed mid-May, harrowed twice.	April 20th to end May.	55 to 60	61	..	65 ac. 3rd crop; bal. very old land.	17	18	18	19	27½	28	127½
11. L. S. Chamberlain, "Box Flat," Marrar.	190	Federation, Firbank.	140 acres fallowed August, harrowed October, disced and harrowed before sowing and harrowed after drill; 50 acres ploughed and harrowed three times.	Mid-May to 1st week June.	45 and 60	45	..	50 ac. 5th crop; bal. over 6.	15	19	19	18	25	27½	123½

Maximum Number of Points ..

*	†	‡	§	‖	¶
1 point for every 1 bushel wheat. 1 ,, 1½ ,, oats. 1 ,, 1¼ ,, barley.	20	20	20	1st crop .. 24 2nd ,, .. 25 3rd ,, .. 26 4th ,, .. 27 5th ,, .. 28 6th ,, .. 29 Over 6 crops .. 30	1st crop .. 24 2nd ,, .. 25 3rd ,, .. 26 4th ,, .. 27 5th ,, .. 28 6th ,, .. 29 Over 6 crops .. 30

Varieties.

There was a smaller percentage of Federation exhibited in the competition than during the few years previously, which is no doubt attributable to the fact that the results from this variety in the two preceding years were rather disappointing. It must be remembered, however, that during the two previous seasons abnormally wet conditions ruled, which were unfavourable to Federation and it would be inadvisable to discard this variety, which in normal seasons has proved the most consistent grain yielder and the most reliable for the sowing of large areas. It is not, however, contended that the whole area should be sown with any one variety, for it is not safe to carry all the eggs in one basket; nor is it advisable to go to the other extreme and sow too many varieties, owing to the trouble of keeping them pure. It is recommended that the sowing be commenced with a slow-growing variety, such as Yandilla King, to be followed by the main crop of Federation, the sowings to be completed with Canberra. Since its introduction four years ago, the last-named variety has proved its superiority as a grain yielder over all other quick-maturing varieties, and in both dry and wet seasons it has always produced a good sample of grain.

Warden has evidently come to stay in the district as a hay variety. There were four crops of this variety in the competition, each of which had produced heavy hay yields of good quality. It is rather late in maturity for the grain farmer, and unless sown very early there would be a danger of the hay harvest clashing with stripping.

Two crops of Bomen inspected promised good yields of both grain and hay, and it is surprising that this variety is not more extensively grown. In Departmental tests for five years it has given excellent results as a dual-purpose variety, and it resisted rust attacks better than any other variety suitable for the district.

Diseases.

The season has not been very favourable for the development of fungus diseases. At Uranquinty red rust was present on the flag, but it was not calculated to do any damage to the crops. Flag smut was fairly prevalent, but there was very little take-all.

Only on one farm was bunt detected. In this instance the seed had been treated in the usual manner with bluestone solution, but had contained bunt balls. As the solution does not penetrate the bunt balls during the short time of immersion the spores contained in them are not killed, and when these balls later become broken, for instance during drilling, the free spores are scattered among the grain, which is thus reinfected. Where it is necessary to use seed containing bunt balls the grain should, prior to pickling, be freed from the bunt balls by winnowing.

In conclusion, the Association is to be commended upon the excellent instruction given per medium of this Annual Crop-growing Competition, which must indirectly lead to increased production.

Temora Demonstration Farm.

SOME RESULTS TO DATE.

P. G. GILDER.

Manager—A. H. MACDOUGALL.

AMONG the soundest agricultural districts of the State must be considered the area comprised within the Temora Police District, in the southern Riverina. For years it has been considered eminently "safe" from a wheat-growing point of view, and the many comfortable homesteads within its borders proclaim its prosperity.

The Temora Police District is divided into five police patrols, viz.:—Ardlethan, Ariah Park, Coolamon (part), Morangorell (part), and Temora itself, which last-named patrol comprises nearly half of the whole district. Of the three-quarters of a million acres of alienated land and the hundred thousand acres of occupied Crown lands, no fewer than 366,816 acres, or nearly half, was cultivated in 1916, when high-water mark was reached.

The district has the proud distinction of containing the highest proportion of cultivated land to total area of any part of the State; this says much for the uniformity of the soil and the progressive character of the people.

In addition to the cultivation area, the land carries approximately 12,000 horses, 1,200 milch cows, 3,000 other cattle (including calves), and 100,000 sheep.

It is somewhat difficult to make fair comparisons as to progress during the past two decades, inasmuch as the patrol districts change in area, and the methods of collecting the statistics vary considerably; but it is of interest to note that since 1905 the cultivation area in the Temora police patrol, which has remained sufficiently uniform to allow the comparison to be made, has more than doubled.

Some idea of the activities of the whole district may be obtained from the following figures, which apply to the last five years.

Year ending 30th June.	Total Area cultivated.	Wheat.			Hay.	Green feed.
		Area.	Total Yield.	Yield per acre		
	acres.	acres.	bus.	bus.	acres.	acres.
1913 ...	232,950	180,994	2,438.467	13·4	43,247	247
1914 ...	277,469	235,074	2,345,956	9·9	32,027	450
1915 ...	281.329	151,787	427.719	2·8	22,359	104,653
1916 ...	366,816	312.501	4,893,160	15·7	47,986	229
1917 ...	311,820	271,988	3 136,971	11·2	33,331	470

Small wonder then that the Borough of Temora, with its 3,500 people, appears eminently prosperous, with its well-built post office, banks, stores and dwellings.

The Objectives of the Farm.

To place a Demonstration Farm in such a community may, at first sight, appear quite unnecessary, as it would seem that the work of the pioneer has been accomplished; but closer consideration of the matter will alter the verdict. There is every reason for the opinion that local methods are still capable of improvement, and it was only after years of agitation on the part of the Temora people that the Farm was established in May, 1912.

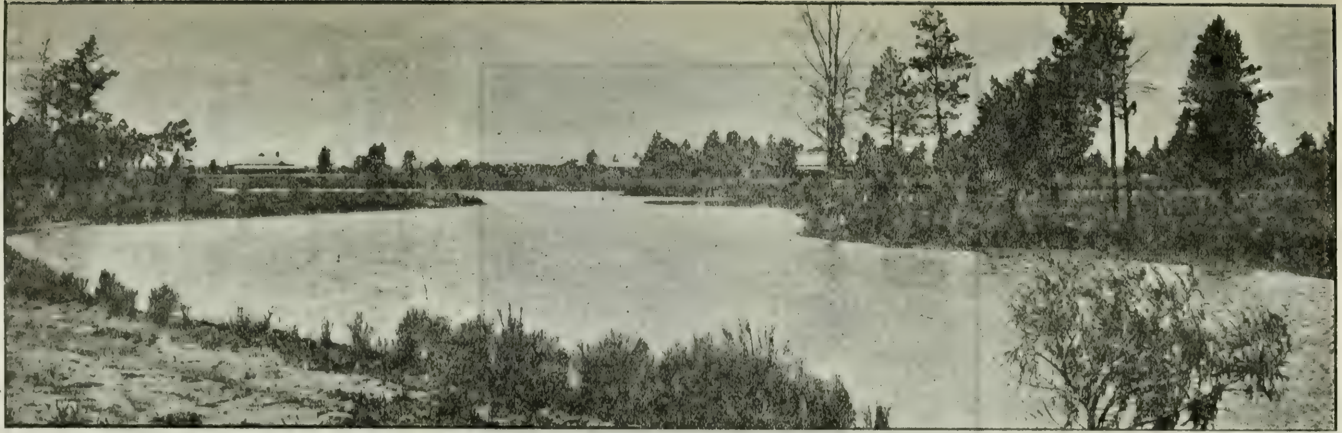
Judging from the results of the past season, it is safe to say that a substantial increase in the yield per acre would have resulted had the methods practised at the Farm been general throughout the district. An increase of but one bushel per acre—at, say, 4s. per bushel—would have resulted in a difference of £46,000 per annum on the average area of 230,000 acres under wheat during the past five years.

A view of the Creek, with the Farm Buildings in the distance.

New varieties have still to be tried out on commercial lines, and old varieties subjected to the strictest selection with a view to possible improvement. It cannot be expected that farmers themselves will undertake such national work.

But the Farm has another phase of usefulness in supplying graded seed-wheat of tested varieties on an extensive scale, and as a result of the year's operations 6,000 or 7,000 bushels will be available for sale. Already large orders have been lodged by local farmers and others.

A third field of activity is the thorough testing of the application of mixed farming methods, and apart from the stud flock of Border Leicesters, valuable experience has been gained with Merinos. The results of double lambing, to which reference will be made later, are of considerable interest.



Another view of the Walladilly Creek

General view of Farm Buildings.

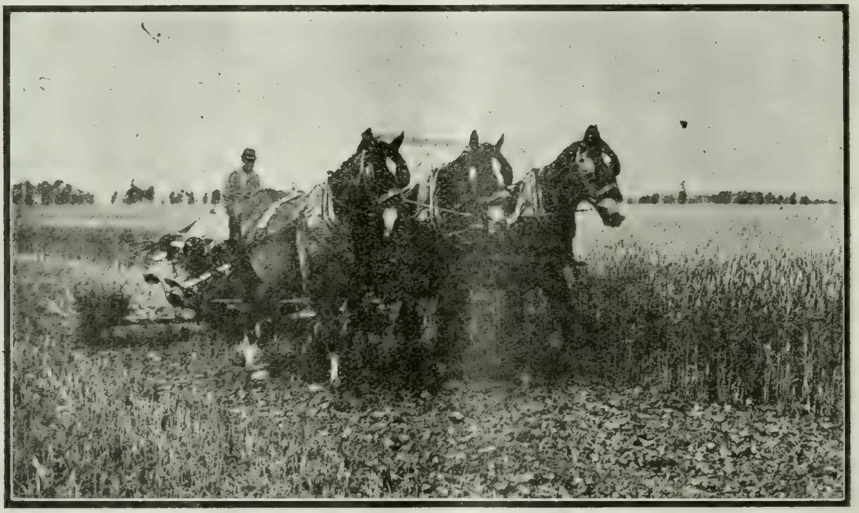
TEMORA DEMONSTRATION FARM

The Farm.

The Farm area consists of a compact block of about 1,600 acres, excluding roads, and is just outside the municipal boundary of Temora, being only 1½ miles from the town itself.

It is almost surrounded by roads, and thus affords excellent facilities for demonstrating to visitors, as well as to passers-by, the methods practised by the Department.

On the eastern boundary lies the Temora-Trungley road, while the western boundary follows the main road to Barmedman and the railway to Wyalong and Cargelico. Temora itself is the junction of this branch with the Barellan-Griffith line, and is rapidly becoming an important railway centre.



The Reaper and Binder at Work.

The excellent railway and road facilities, the close proximity to the town, the compactness and convenient arrangement of the block, and the fact that the land is typical of many thousands of acres in the vicinity, make the area eminently suitable for purposes of agricultural education.

The Farm is a part of the old Temora gold-field of 1880, known as the "Deep Lead" by miners and old residents, a name stated to have been given on account of the wash of gold-bearing strata being much deeper than in other parts of the field. There are many interesting—and annoying—evidences of the old time workers of the soil, and the shafts and corresponding heaps are in places an obstacle to farming operations.

In some cases it may be profitable to fill up these holes, especially where they materially interfere with cultivation, but at best it is only a spare-time job, which at any moment may have to give way to more urgent work which claims attention.

Climatic Conditions.

Temora is about 958 feet above sea level, and its average rainfall for the past thirty years is 19·28 inches, which is on the whole well distributed throughout the year. The averages for the highest months (June and October) are 2·17 and 1·97 inches respectively, while that of the lowest month (February) is 1·05 inches.

The average rainfall during the wheat-growing season may be classed as sufficient, but a study of individual years will reveal times, such as the seasons of 1916–17 and 1917–18, when the precipitation was detrimentally generous, while the past season's rainfall was such that only the most careful cultivation methods could ensure a payable crop.

The harvest seasons are generally fine, calm, clear, and free from hot or severe winds and rainstorms, thus conducing to its value as a grain-producing district. As was stated in one of the earlier annual reports on the Farm—

> The average maximum summer temperature is about 98 degrees Fahr., and the average summer temperature about 90 degrees. In summer the air is clear and dry, with a bright, hot sun ; during the winter the air is clear, crisp and frosty, but too cold for vegetation to make much growth. The autumns are very calm, with warm days and cool nights. The spring seasons are rather warm, with clear and pleasant nights. During the spring or growing season, all vegetation makes exceptionally rapid growth. This is especially noticeable in the case of the grasses and herbage which are indigenous to the district. This rapid growth of the native grasses during the spring and the short period within which they can be profitably utilised, presents one of the most difficult problems to be successfully mastered by the mixed farmer in this part of the State.

Soil and Timber.

About 1,100 acres of the Farm consist of a surface soil of loam about 8 inches deep, with a somewhat stiff red clay subsoil, and the balance of 500 acres of a lighter loam about 12 inches deep, with a strong red clay subsoil. In places the subsoil comes nearer to the surface, and there are patches on which the water may lie for a time after rain.

On the whole, it must be classed as typical of much of the Riverina country, and there are considerable areas of sufficiently uniform character on which experimental work can be carried out. One such area of about 70 acres, facing the Trungley road, is eminently suitable for this purpose, and has been selected by the Experiments Supervision Committee of the Department with a view to its utilisation as soon as an experimentalist is appointed.

The whole area of the Farm has been heavily timbered with white, grey and yellow box, pine, and oak, together with a sprinkling of red gum in the watercourses. With the exception of the pine, the timber was not valuable or useful, except for firewood.

A large quantity of the original timber was cut down by the miners over thirty years ago, and when the Department took over the property, the suckers which had shot up afterwards constituted most of the timber on the Farm.

Water Supply.

Among the special features of the Farm may be mentioned the generous facilities for watering stock. Apart from five small tanks which had been put down by original owners, the farm is watered by the Walladilly or

Trigalong Creek, which runs through the northern half of the Farm for a length of about a mile and a half. On this creek two dams have been constructed ; and as will be seen from the illustrations, they not only add to the effectiveness of the property as a mixed-farming proposition, but give it a double water frontage, which greatly improves the appearance of the whole Farm.

In this connection an interesting experiment in stocking inland waters with fish has been carried out. During the latter end of 1913 a supply of 1,112 Australian bass was placed in the dams, and they appeared to be doing well, as far as could be observed by the catching of odd ones. But on an officer of the State Fisheries making a number of hauls with a net in April, 1918, only two small Australian bass were caught, and it was not possible to ascertain whether the fish had naturally reproduced in the dam. Until it is definitely ascertained that natural reproduction has taken place, the permanent acclimatisation of the fish cannot be considered to have been accomplished, while the size of the dam rendered it practically impossible to make an exhaustive test.

In the Wheat-fields.

However, the experiment has not been abandoned, and in May the State Fisheries liberated about eighty mature fish of the following varieties in the dams of the Farm :—Murray cod, Murray yellow-bellied perch, Murray blackfish, and Murray catfish. No fishing is allowed at present, and the results will be awaited with interest.

Cultivation Area.

At the present time 900 acres are being used for the growing of seed wheat, and of this, one-half is sown each year and the other half fallowed. The balance of 100 acres is reserved for the growing of fodder and pasture crops for sheep ; these crops will chiefly comprise lucerne and dwarf rape. The remaining 700 acres have been left under natural pastures for grazing purposes.

A Seasonal Contrast.

The last two seasons have been markedly different in respect of rainfall, and the effects upon the varieties tested are of considerable importance.

The season 1917–18 was one of excess, over 20 inches falling between June and December, 1917. As a consequence the growing and ripening crops were considerably damaged and much lodging was caused, all varieties of wheat being more or less affected.

The past season has been in marked contrast to this, the rainfall during the growing period being as follows:—April, 1918, 162 points; May, 161; June, 137; July, 139; August, 353; September, 67; October, 89; November, 6; December to harvest, nil.

While the August rainfall was greatly in excess of requirements, and could not be profitably utilised by the crops, the total rainfall during the succeeding four months was only 162 points.

Summary of Operations for 1917-18.

The operations for 1917-18 may be summarised as follows:—

Paddock.	Area.	Variety.	Seed per acre.	Superphosphate per acre.	Yield per acre.	
					Grain.	Hay.
No.	acres.		lb.	lb.	bus.	cwt.
6	40	Federation	40	48	18	...
6	68	Hard Federation ...	40	46	12	...
6	8	Zealand	40	56	13½	...
2	30	Zealand	40	56	...	37
2	53	Marshall's No. 3 ...	44	46	16	...
2	46	Yandilla King ...	45	48	17½	...
2	72	Canberra	45	56	25	...
3	8¾	Comeback	60	56	18	...
3	4¾	Bunyip	60	56	17½	...
4	17	Canberra	50	56	25	...
4	6½	Firbank .. .	60	56	15¼	...
4	11	Florence	60	56	22	...
4	18	Sunset	60	56	14¼	...
4	1½	Comeback	60	56	18	..

The areas mentioned are those which were sown, but the yields of grain refer to those actually stripped. Owing to rainstorms, &c., parts had to be cut for hay, and a total of 200 tons of hay and 75 tons of straw was harvested.

These results, under the circumstances, are noteworthy. It must be remembered that the sowing season was not at all favourable after the heavy rains of 1916, as the land had set down and was very hard and dry for ploughing in the early summer of 1917. Fallow-land was very scarce owing to the abnormally wet season, and although it was intended to fallow 500 acres, and the plant was available for this purpose, only 186 acres could be touched, and most of this was handled after the 1st of September.

In addition, mice played havoc with the seed in some paddocks, and there was at one time every prospect of a very thin crop.

One of the results of the unusual wet conditions of 1917–18 was the failure of both varieties of Federation. The ordinary variety was sown on fallowed land and was badly affected by rust, which lowered the yield considerably and lessened the commercial value of the grain. Hard Federation in the same paddock, adjoining the other but sown on stubble-land, was very badly affected with take-all, slightly rusted, and lodged considerably.

Recent Results.

The cropping operations for the current season may be summarised as follows :—

Paddock.	Date Sown.	Area.	Variety.	Seed per acre.	Super-phosphate per acre.	Yield per acre.	
						Grain.	Hay.
	1918.	acres.		lb.	lb.	bus.	cwt.
Experiment Area ...	16 April ...	13	Zealand	41	46	19	...
,, ...	17 April ...	14	Marshall's No. 3 ...	42	45	24·07	...
,, ...	18 April ...	17	Yandilla King	40	40	25·09	...
,, ...	20 April ...	14	Currawa	42	45	21·27	...
,, ...	22 April ...	12½	Bomen	45	45	25·15	...
No. 1 ...	30 April to 6 May.	71	Yandilla King	40	40	......	35
,, ...	6–9 May ...	33	Bomen	40	40	24*	...
,, ...	9 May ...	5	Bomen	44	45	20·78	...
,, ...	12 April ...	4½	Algerian Oats	60	56	36·19	...
,, ...	10 May ...	6	Improved Steinwedel ...	60	56	20·3	...
,, ..	11 May ...	10	Hard Federation ...	55	56	23·86	...
,, ...	14 May ...	½	Penny	40	56	20·45	..
,, ...	14 May ...	5½	Comeback	55	56	16·2	...
,, ...	14 May ..	8	Canberra	55	56	27·5	..
,, ...	15 May ...	7½	Firbank	60	56	20·0	...
,, ...	15 May ...	5	Sunset	60	56	......	32
,, ...	21 May ..	17½	Florence	60	56	19·82	...
,, ..	20 April to 10 May.	175	Federation	37	40	21*	..
,, ...	23 May ...	10	Hard Federation ...	60	56	24·5	...
,, ...	24–25 May..	21	Canberra	60	56	24·0	...

* Not cut at time of visit ; estimated only.

While the areas referred to were sown, the acreage stripped was slightly smaller, owing to the cutting of headlands, &c., for hay. The yields quoted are, of course, based upon the area actually stripped.

The season was a favourable one, and as the land had been fallowed and was in splendid condition, no delays occurred, with the exception of one week, from 15th to 21st May, owing to rain. Sowing, as will be seen from the summary, was commenced on 12th April, and the whole area was completed and the drills back in the shed on 25th May.

The germination was good throughout and the crops grew splendidly. As the early sown crops in the experiment area of 70 acres were somewhat forward 200 sheep were depastured on them during June to check the growth, and an excellent stooling resulted.

A 20-bushel Crop of Firbank Wheat.

Algerian Oats.

Yield, 36·19 bushels per acre.

TEMORA DEMONSTRATION FARM.

Notes on Varieties.

The behaviour of the varieties under the two extremes of seasonal conditions is worthy of note.

Canberra holds the distinction of proving the highest yielder of grain in both years, and is the best for late sowing in the Temora district. It is slightly weak in the straw, being about equal to Hard Federation in this respect.

Hard Federation.—The 1917–18 experience with this variety has already been referred to. Under the drier conditions of the past year it gave a yield of nearly 24 bushels of plump bright grain in one paddock and 24½ bushels in another. It is a consistent cropper in normal times, but not essentially a heavy yielder. It can be sown up to a fortnight later than ordinary Federation.

Draught Mares and Foals at the Farm.

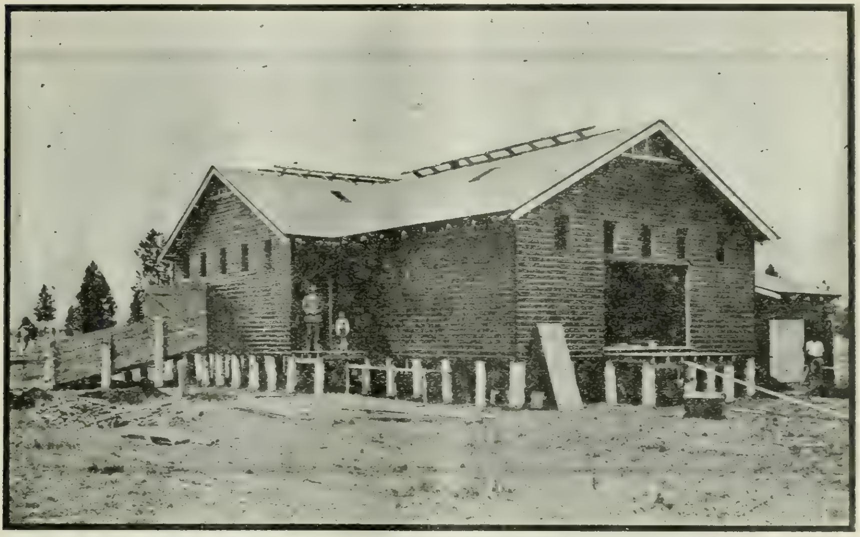
Federation.—The paddock of 175 acres of this variety was a splendid sight at the time of visiting the Farm, and was estimated to yield about 21 bushels per acre. The seed was raised on the Farm the previous year, and the result shows that Federation has not lost the valuable characteristics which have made it such a factor in the extension of our wheat areas. Much of what is commonly known as Federation has become very mixed, and has possibly deteriorated. The true type appears to be scarce.

Yandilla King is the best dual-purpose wheat for the local conditions, as it thrives in both wet and dry seasons. It stood up splendidly in storms when Federation and Hard Federation went down. It cuts well with the reaper and binder—in fact, the Manager considers it the best wheat in this respect. The yield of 35 cwt. per acre of splendid quality hay, over an area of 71 acres, made it a profitable crop this year, while a grain yield of 25 bushels per acre puts it in the front rank.

Zealand has proved a very good hay wheat, but is not so suitable for grain. It is weak in the straw, and cannot be classed as such a good dual-purpose variety as Yandilla King.

Marshall's No. 3 has proved another dual purpose wheat. It is slightly weak in the straw and inclined to lodge.

Bomen must be classed as one of the best grain wheats for mid-season sowing in the district. Under the unfavourable conditions of 1917–18 it yielded 20 bushels, while during the current season it has yielded over 25 bushels in one paddock and nearly 21 bushels in another. Another advantage is that it makes very fair hay if sown early.



Shearing Shed, in course of Erection.
The yards had not been started at the time the photograph was taken.

Improved Steinwedel has shown itself to be a good dual-purpose wheat, but it is still somewhat apt to shell. The yield of 20 bushels, though not as high as many others, must be considered satisfactory under the conditions.

Currawa has found favour with some local farmers, who have obtained good yields in wet years. It resembles Yandilla King in many respects, but is much inferior to it as it does not stand dry weather so well. It should, however, be worthy of further trial.

Comeback has proved a shy yielder, and cannot be recommended for commercial purposes, as its yield in normal years will not be more than 75 per cent. of many other varieties. It has proved weak in the straw and inclined to lodge.

Firbank is a good wheat for late sowing, and thus its use enables the planting season to be extended. It cannot be recommended as a general thing, but, like Florence, can be ranked among the late-sowing varieties suitable for both grain and hay.

Florence is not quite so good for hay as Firbank, but has proved on the whole a somewhat better grain yielder.

Sunset is rather too early for Temora, and is liable to be frosted. It is very weak in the straw. The 5 acres sown last season was intended for grain but owing to late frosts it was decided to cut it for hay. Half an acre cut at the right stage yielded 27 cwt. per acre, but the balance, cut two weeks later, yielded 33 cwt. per acre of very fair hay. Sunset is not a hay wheat but makes average quality hay, and as it is so early it is especially useful for sowing on dirty ground, and cutting for hay early. The ground should then be fallowed at once before any black oat seeds and other pests have time to mature and fall.

The Stables.

Penny is a promising variety emanating from Victoria. Only 20 lb. seed could be obtained, but this was used to sow half an acre, and yielded at the rate of 20½ bushels to the acre. It is certainly worthy of further trial.

Algerian Oats were tried for the first time, and gave over 36 bushels per acre. It was the first crop to be sown this season. It may be recommended for growing every three or four years in paddocks infested with take-all, and cutting for hay.

Cultivation Methods.

While the methods have to be adapted to the climatic and other conditions, the broad principles underlying the cultivation of the wheat crop remain the same.

To achieve the good results as recorded, the following operations were carried out:—

The stubble was eaten off by sheep, and anything not disposed of in this way was gathered by the hay-rake and burnt. About the 1st of June the land was ploughed with the mouldboard about 4 inches deep, and followed by a harrowing. Sheep were put in at various times to keep down weeds.

It was cultivated once before the end of the year, and again just before drilling. On some parts these two cultivations were both with the spring-tooth; in others, once with the spring-tooth and once with the disc. One harrowing was given after the disc, but none to the other, the seed in the latter case being drilled at right angles to the cultivation.

It will, therefore, be seen that the actual cost of working the fallow and preparing the ground for the crop was extremely low.

One result, apart from the uniformly good character of the crops, has been the marked absence of weed growth, but it is not forgotten that the land has not been cropped frequently.

The Manager's Residence.

Hay Production.

With excellent freight facilities and proximity to railway, Temora has become one of the main hay-producing centres of the State, and the area cut for this purpose in the district has ranged from 22,359 to 47,986 acres during the past five years.

Under such circumstances the desirability of the farmer having two strings to his bow and using dual-purpose wheats is apparent. The hay market is subject to extreme fluctuations, and a year of good prices is often followed by a glut, when the rate for chaff spells a loss on every consignment, owing to the high cost of cutting, bagging and freight.

It is fortunate, therefore, that there are varieties which can be handled interchangeably as the season and market requirements indicate. The kinds most suitable in the Temora district are Yandilla King and Marshall's No. 3 (for early sowing), Improved Steinwedel (for mid-season sowing), and Florence and Firbank (for late planting).

A Rotation for a Grain and Hay District.

Where a man is catering for the grain and hay market, a rotation which gives two crops every three years may be adopted without neglecting the requirements of fallowing.

On a living area of, say, 400 acres cultivation (apart from the horse run, &c.) divided into three approximately equal parts, a rotation suggested by the Manager is as follows:—

	Paddock.		
	1.	2.	3.
First Year ...	Grain	Hay*	Fallow.
Second Year	Fallow	Grain	Hay.*
Third Year...	Hay*	Fallow	Grain.

* These hay paddocks would be fallowed by ploughing 4 inches deep as soon as the teams were available after stripping, say early in January.

"Kelso Style."

Border Leicester Stud Ram.

If no sheep were carried the stubbles would have to be burnt, but on such an area, with a little grazing, 100 ewes with lambs could be carried, thus utilising the stubbles and keeping the fallows clean. The rotation suggested thus provides for a hay crop, short summer fallow, grain crop, and long fallow within the three years, and tends to greatly equalise the labour and horse work throughout the whole of the year.

Combining Wheat with Sheep.

Though the Farm was started in 1912, it was not until October, 1916, that it was possible to test the capacity of the area for sheep. Six Border Leicester rams were transferred from other Departmental Farms, and 300 Merino ewes of good type were purchased off-shears. Lambing commenced about 20th March, 1917, and practically all had been dropped on 15th April. As a result 82 per cent. of robust lambs were marked on 3rd May.

In order to get a second lambing, the ewes were again mated with the same rams, with the result that a further drop of 64 per cent. was recorded in October, 1917. A total of 146 per cent. was thus obtained in twelve months. The whole of these lambs did well, and were sold locally at highly satisfactory prices. All Merino ewes were again mated with Border Leicester rams early in 1918, resulting in a drop of 101 per cent.

The Pure-bred Border Leicester Flock.
Note the sturdy lambs.

Double Lambing.

In connection with this total drop of 247 per cent. in two years, attention may be drawn to the possibilities as well as the disadvantages of attempting to obtain two lambs from the same ewe in the one season. While it may be recommended as a purely emergency measure in order to rapidly increase the flocks of the State after a period of drought, it must be remembered that success depends very largely on the season, and the first of the two years was one of ample rainfall and a corresponding supply of green feed.

The second lambing was, of course, very late, and made the lambing for the following season correspondingly late, though the results in this case were good.

The practice is likely to affect the constitution of the ewe, and also the total wool production for the year. On the whole, the best results under average conditions are likely to be obtained from having a single lambing early, *i.e.*, in April or May.

The Border Leicester Stud Flock.

The small flock of Border Leicesters was transferred from Cowra to Temora in June, 1917, and since that time the flock has been materially improved by the inclusion of new blood and the purchase of eighty high class stud ewes during the past year, until it is now one of the leading stud flocks of the breed within the State. It is registered in the Flock book of the Australian Longwool Breeders' Association.

In his last annual report the Sheep and Wool Expert stated that:—

> The Border Leicesters have shown every disposition to respond to the locality. That they breed readily may be judged from the last year's lambing returns when 110 per cent. of lambs was recorded. So far no difficulty has been experienced in the disposal of all available rams. Up to the present, operations have been confined to the raising of rams of the ordinary flock class; but with the improved conditions afforded, it is hoped to meet with success in the distribution of stud stock, as the object is to raise the flock to that point of excellence that we may be able to supply registered breeders with a class of ram especially adapted to New South Wales conditions.

The uniformly successful results obtained from crossing the Border Leicester with the Merino will have been recognised by readers who have kept themselves familiar with the extensive series of experiments conducted by the Department at the various Farms. The Border Leicester ram is now more frequently used for cross-breeding in the Temora district than that of any other breed.

Buildings and Equipment.

While the buildings at the Farm are necessarily of a somewhat more ornate appearance than those we usually associate with the average farm, they are in reality strictly utilitarian in character. The sheep-yard equipment (shearing shed, yards and dip) is mainly on the lines of those at Trangie and North Bangaroo Farms, illustrated in the last two issues of the *Gazette*.

Already the sheep dip is proving a great convenience to neighbouring flock-masters, and the advantage of having such facilities is being recognised. In this way the work of handling the small flocks, which are incidental to mixed farming conditions in the district, is being materially improved.

Conclusions.

Perusal of the foregoing notes will indicate that the Temora Demonstration Farm, under the management of Mr. A. H. Macdougall, has fully justified the action of the Department in inaugurating it. No visitor familiar with local conditions can fail to be impressed with the results.

While some of the work is necessarily of an experimental character, and cannot be immediately remunerative, the main bulk of the work is conducted on strictly commercial lines, with results gratifying to the Department, and of immense value to the district.

The "Yema" Graft of the Vine.

H. E. LAFFER, Viticultural Expert.

In the general scheme for establishing a vineyard on phylloxera-resistant stock, the plan usually adopted is one or other of the following:—

1. Planting out vines which have been grafted in special nurseries and grown for one season before transplanting into the vineyard.
2. Planting rootlings of the resistant varieties, and afterwards working them to the desired varieties for fruiting purposes by grafting in the field.

It is in connection with the second of these that the so-called "Yema" graft or "summer bud" is used. The graft was observed by Mr. F. de Castella, Government Viticulturist of Victoria, when on a visit to Spain in 1908, and it was described and illustrated by him in the Victorian *Journal of Agriculture* in 1909. Since that time a good deal of use has been made of the system in Victoria, with most excellent results. To the man who is reconstituting gradually and in small areas, this system of grafting has much to recommend it; and a more general adoption of the methods herein described would be an advantage to New South Wales. There is no question that this form of graft makes an ideal union between stock and scion, and its advantages may be summed up as follows:—

1. The graft is made with a minimum of injury to the stock.
2. The operation is carried out in the late summer, when the conditions may be said to be ideal for callousing.
3. Scions can be selected from the best bearing vines, as they will be carrying fruit when the scions are cut. Absolute uniformity of type and variety are thus assured.

That the unavoidable exposure of tissues in all forms of budding is less than in the so-called "grafting" methods is well known. This "Yema" graft is not a true form of budding as we generally understand it, because the term "budding" is applied to those operations which imply the transference from the scion to the stock of a herbaceous bud during the vegetative period. In the case of the "Yema," the bud is cut from the scion stick in such a manner as to include a considerable amount of woody tissue, as will be observed from the illustrations. This bud or scion is then dovetailed into a corresponding section made in the side of the stock. There is no splitting or cutting off of the stock, and its vegetative processes continue while the union of the bud and stock are taking place. The time of operation (February and March) may be said to represent a period where there is the greatest combination of factors conducive to a proper union.

With spring grafting, the formation of callus is often impeded by an excessive rush of sap, but in February or March there is little danger of such a thing occurring. The period of active vigour has passed, the vines having settled down to the ripening of the fruit and wood. Temperatures are warm, and nature rapidly produces the callus needed to unite stock and scion. The result is a graft which may be said to be as near perfection as we can reasonably expect to attain.

The fact of being able to select the scions from vines in bearing will obviate the possibility of propagating from inferior types. This is a point to which greater attention should be paid in selection of both scions and cuttings for raising young vines. The presence of degenerate types may materially reduce the average yield of a vineyard, and unless care is taken to place some distinguishing mark upon such vines, or upon others which may be of distinct variety, there is always the probability of perpetuating these when selecting cuttings from dormant vines.

Care of the Scion.

It is important that the scions should be of well-matured wood, of a convenient size, and free from disease. As far as possible the canes chosen as scions should be clean and free from lateral growths, because a bud with the base portion of a lateral attached is usually too large for the average stock. Where time permits, it is a good plan to choose the vines from which scions are to be secured early in the season, and to prepare them by pinching out the lateral growths as they begin to develop. In this manner, good even scions are to be had when required. The dimensions of the canes chosen for scions will be regulated by the size of the stocks being worked, and as a rough guide we may say that the diameter of the node, or enlarged portion where the bud is situated, should be approximately equal to the diameter of the stocks. When the "budding" operations are to commence, the scion canes are cut from the vines and immediately all the leaves are removed in order to prevent evaporation. It must be borne in mind that under the hot conditions of February or March, the canes will rapidly dry up if exposed, and it is necessary to observe all precautions to prevent drying and deterioration of scions. The best plan is to secure a few scions at a time, so that they may always be fresh, and this is a simple matter if the scion vines are handy to the scene of operation. According to the distance from which the scions are to be secured, one or more day's supply may be secured at a time, care being taken to immerse them in a vessel of water to maintain their vitality. They may be transported for some distance when wrapped in wet sacking or cloth ; and when in use it is a wise plan to carry a few scions at a time, keeping them all the while covered with wet cloth or else immersed in a bucket of water.

The Operation of Budding.

In order to ensure the greatest measure of success the stocks to be 'Yema" budded should be in good order, with a good flow of sap. This condition is assured in a normal season by good cultural operations, but in a dry season it would be advisable to give a watering about two weeks before operating. The best size for stocks would be about one-half inch in diameter. Larger or smaller stocks are rather more difficult to do, although it is largely a question of getting buds of suitable size.

The stocks should for preference be clean and straight in the stem, in order that the bud may be placed in the best position, which is about 2 to 3 inches above the soil level.

The first operation is to cut out the bud from one of the selected scion canes, as illustrated in Fig. 1, B. From the stock a corresponding piece is cut out (Fig. 1, A) and the bud is inserted to fill this (Fig. 1, C). The tying can be done with a few strands of raffia or twine above and below the bud, and care must be observed not to use too much tying material, as it impedes the formation of callus. This material will usually decay after a few weeks, but it is well to examine some of the grafts, and if there is a tendency to strangulation the ties should be cut.

Another form of the graft is represented in Fig. 2, which is rather more complicated than the first one.

In all methods of grafting the simpler the operation the better, and the greater the percentage of successful grafts which will be secured. At the same time, speedy operation is an advantage, as greater numbers can be done per day.

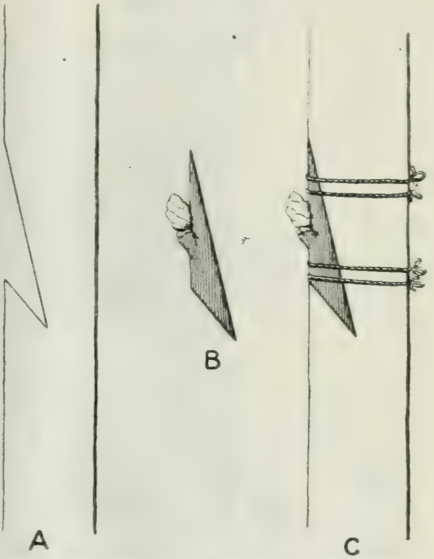


Fig. 1.—The "Yema" Graft. A, Cut in stock. B, Bud from selected scion. C, Bud inserted and tied.

To this end, the system as illustrated in Fig. 3 is to be strongly recommended. It represents a modification of the "Yema" bud as adopted by Mr. J. C. Rounce, late of Mildura, and now Superintendent of the Mirrool Viticultural Nursery. The main features in this modified form of the bud are simplicity of operation, minimum number of cuts needed, no necessity for tying, and consequent greater rapidity of operation.

The bud, as cut out from the scion cane, is shorter than usual, starting about half an inch above the bud and ceasing with an abrupt angle just below it. In preparing the stock the first cut is the transverse one to make the angle at the base. The piece is thus removed with a slicing cut, as in Fig. 3, A. The tongue at the top of the section is thus raised and the bud inserted, as in D.

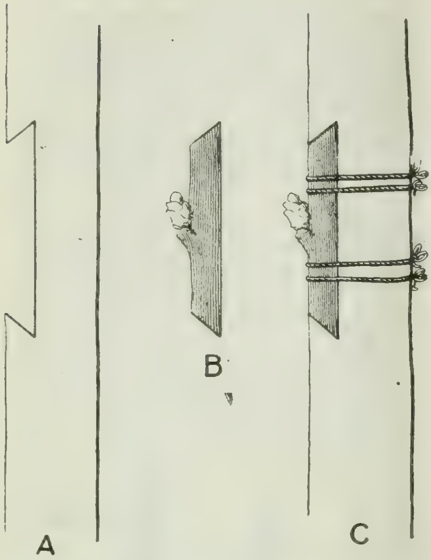


Fig. 2.—A rather more complicated form of the "Yema" Graft than is illustrated in Fig. 1.

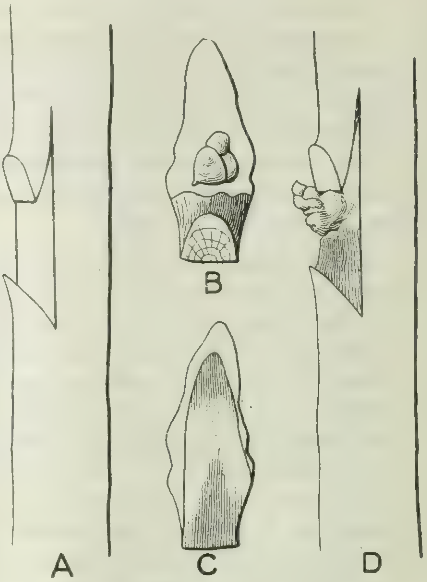


Fig. 3.—A modified form of "Yema" Graft. The features claimed for this are simplicity of operation, minimum number of cuts needed, no necessity for tying, and consequent greater rapidity of operation.

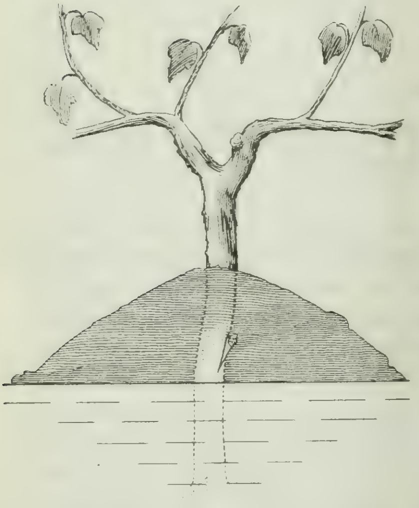


Fig. 4.—The "Yema" Graft mounded up with fine earth to a height of 8 or 9 inches.

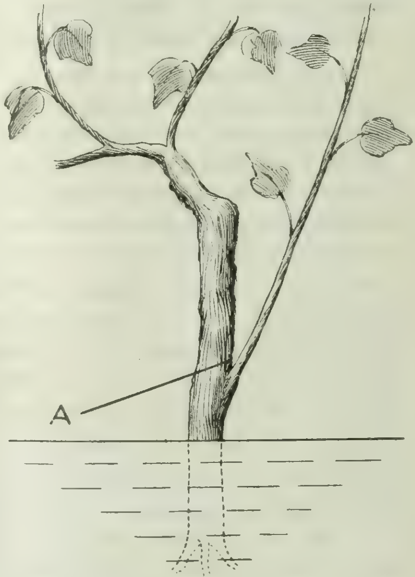


Fig. 5.—Growth from "Yema" Graft. The stock is finally cut back at A.

The main point to be observed is that the sections are straight and smooth, when they fit closely together and are held in contact by the upper portion of the scion beneath the tongue.

As soon as the graft is completed, the whole vine should be mounded up with fine earth to a height of 8 or 9 inches. This soil protects the bud from evaporation, and acts as a perfect callousing medium. (See Fig. 4.)

After-treatment of Stock.

The graft remains covered with soil throughout the autumn and winter, and if the union has been successful, the bud will begin to grow in the following spring. On no account should the stock be cut right back to the bud straight away. In the winter the top canes may be shortened back to facilitate cultivation, and in the early spring a good portion of the head may be removed. The remaining portion acts as a draw to the sap, and at the same time permits the bud to obtain enough nourishment to force it out. (Fig. 5.)

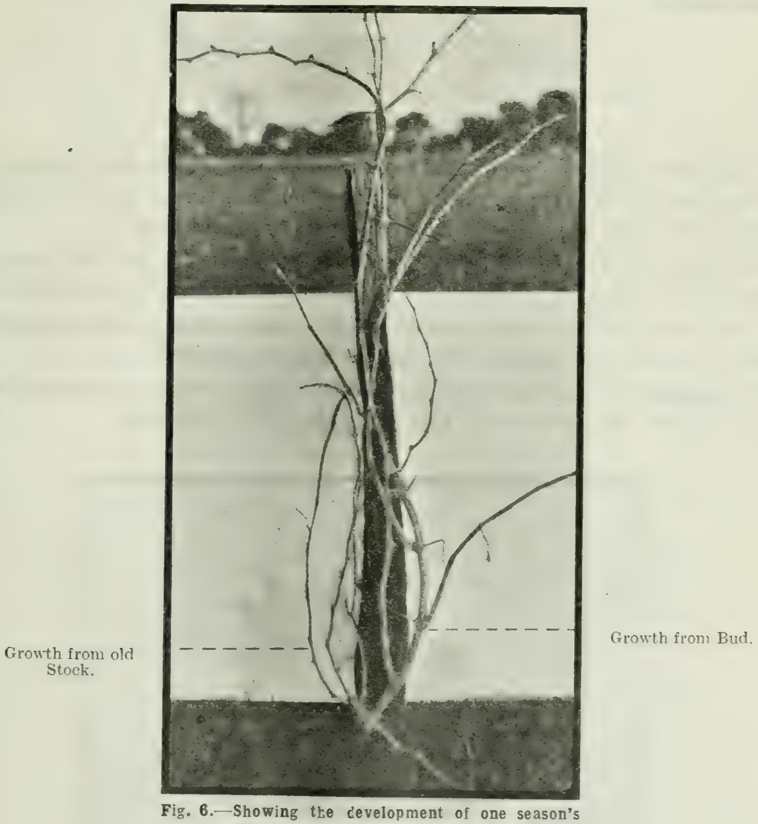


Fig. 6.—Showing the development of one season's growth from a "Yema" bud in the Corowa district.

A strong growth will be obtained, which should be staked to prevent breakage. The head of the stock is not cut right off until the succeeding winter, though it may be checked back from time to time. It is finally reduced at A, leaving a short piece of the stem above the bud. This will die back and in the next season can be cut off close to the union, when a better joint will result.

A reference to Fig. 6 will show the development of one season's growth from a "Yema" bud, the photograph having been taken in the Corowa district. Almost without exception, the growth from these buds is much greater than from grafted vines planted at the same time. Many growers who have tried this system are strongly in favour of it as opposed to planting grafted rootlings, and, particularly for the smaller areas, it is worthy of all consideration.

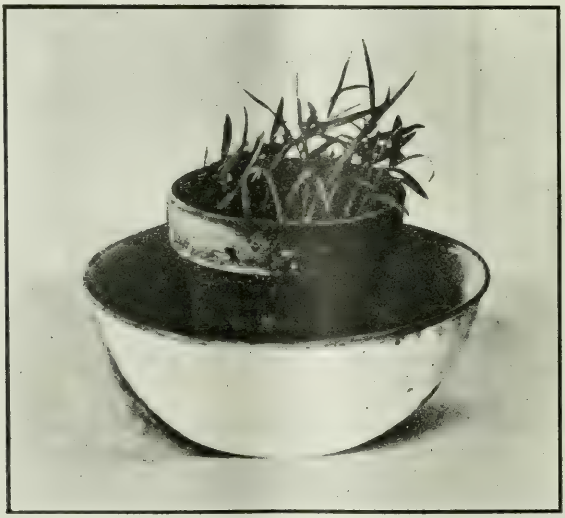
TESTING PASPALUM SEED.

AT the Hawkesbury Agricultural College we have always had difficulty in getting paspalum seed to germinate when making tests, until the simple method shown in the accompanying illustration was adopted.

The seed is scattered over the surface of soil made up with plenty of vegetable matter in it, in an ordinary flower pot, and then covered lightly.

The pot is put in a basin in which water is maintained to about a depth of about 2 inches ; this supplies the regular moisture required.

The apparatus is put in a sunny place on a table close to a window, and is found to give results in ten to fourteen days.—C. T. MUSSON.



The Passion Vine Longicorn Beetle

(*Monohammus fistulator*).

W. W. FROGGATT, F.L.S., Government Entomologist.

Most of the beetles belonging to this genus are subtropical in their distribution, over one hundred species of the genus *Monohammus* having been described, chiefly from America, Africa, Asia, the Malay Archipelago, and Australia. The species under review has a very wide distribution; Germar described the type from Java in 1824; and Pascoe, redescribing it, many years later, added six other localities in the Malay Archipelago, India, and Ceylon, and he first recorded it from Queensland.

In Masters' catalogue it is listed from Queensland, Victoria, and New South Wales. Mr. A. M. Lea tells me he has it from Kangaroo Island, South Australia; and Mr. C. French, junior, informs me that he generally finds the beetles upon the foliage of *Helichrysum ferrugineum* during the summer months in the Lilydale and Emerald districts, and thinks that in Victoria it breeds in the stems of the "dogwood." I have bred specimens from the stems of the cultivated fig growing in Sydney gardens. In dealing with any indigenous insect that becomes a pest it is very important to be able to discover its native food plant; but up to the present it has not been identified with any shrub in the Gosford scrubs.

All the members of the genus *Monohammus* are handsome, dark-coloured beetles, thickly clothed with very fine hairs or pubescence. They are somewhat elongate in form, with long antennæ without spines or hairs; the prothorax is produced on either side into a stout, short, conical spine. They are related to the giant longicorn beetles in the genus *Batocera*, another tropical group that have these characteristic thoracic spines.

Though only recently brought under my notice as a serious pest to the cultivated passion-vine in the Somersby district, near Gosford, from damage done to old passion-vines, it is probable that they have been in the orchards in a minor degree for the last two or three years.

This last season Mr. A. R. Studds, "Allambi," Somersby, reported that a great number of his passion-vines were badly infested with a borer, and through the good offices of Mr. Fruit Inspector O. Brooks a large quantity of infested material was collected and forwarded to the Entomological Branch for investigation. The first beetles were obtained early in October, but the infested stems contained active larvæ and pupæ until the end of December; so that under normal conditions the beetles are active and laying their eggs all through the last three months in the year.

In many cases only one larva was feeding in the stem, but in the swollen base of some of the largest passion-vines four and five larvæ were obtained. The eggs appear to be deposited singly in or upon the bark close to the ground, the active larva feeding upward through the central portion of the stem for a distance of 3 or 4 feet before it is full fed and ready to pupate. They are, however, somewhat erratic in their movements, for the larvæ sometimes burrow down through the main roots underground.

Description of Larva.

The larva is shining dull white in colour, with the head dark chocolate brown, furnished with stout black jaws. Length, 1½ inches. The first thoracic segment is large, flattened on the dorsal surface, marked on the sides with light brown, the central portion finely granulated with minute reddish dots; the second and third thoracic, and the following abdominal segments, except the eighth and ninth, deeply constricted, and each bearing an elongate oval patch of raised warts, forming four rounded ridges on the upper surface, with a corresponding patch on the under side, which is formed of two lines swelling into a rounded lobe at the extremities; the last two (eighth and nineth) segments rounded without any markings. Some larvæ, evidently in a much later stage, which did pupate, and were either undeveloped or in an unhealthy condition, were much darker coloured and more flattened and flanged along the sides than the typical form.

Description of Pupa.

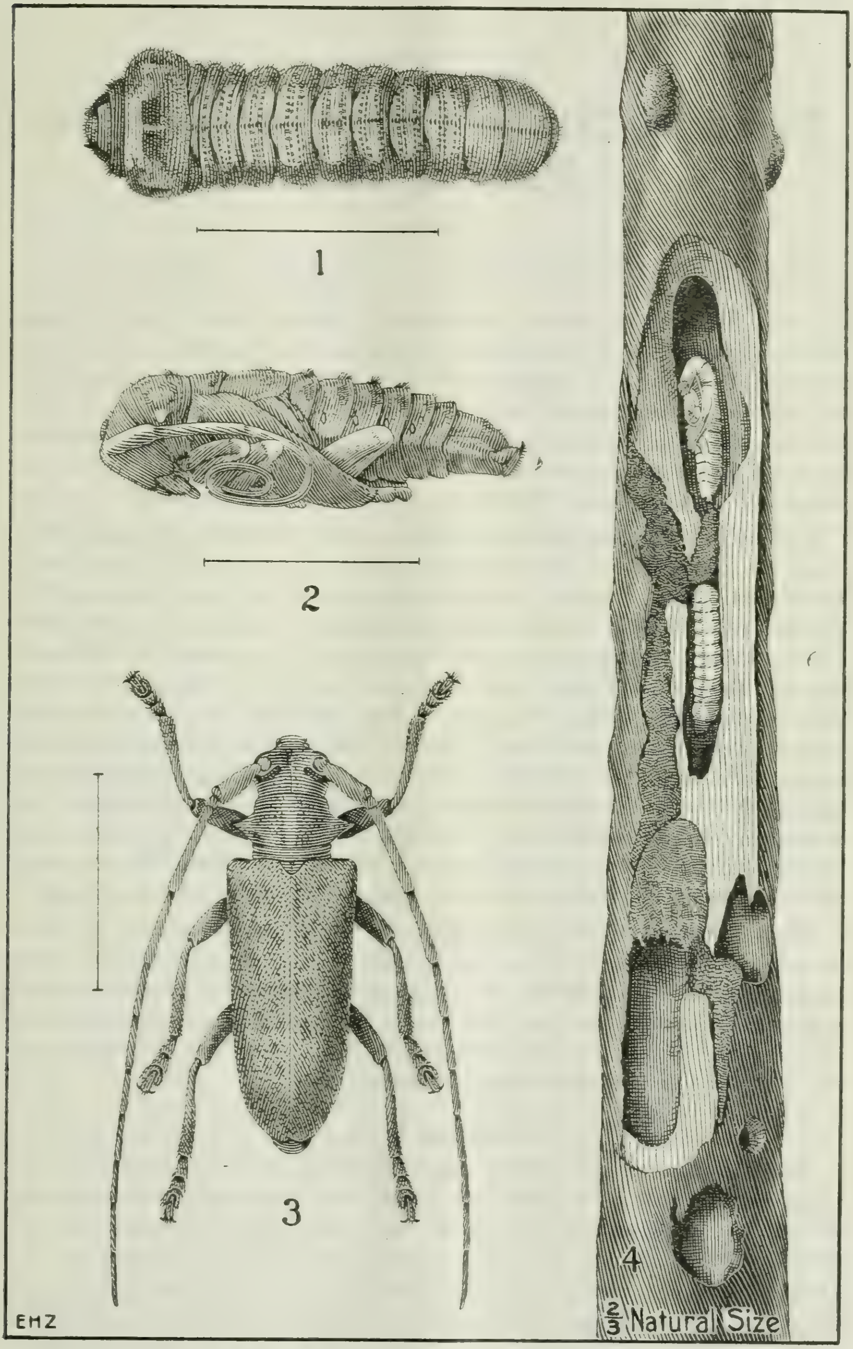
The pupa is dull white, flattened and broad across the centre; the head small, turned down in front, with scattered reddish hairs on the face; the antennæ thickened and turned downward. The dorsal surface of the thoracic segments are flattened; the first two small, clothed with a double patch of stiff reddish brown hairs. The first six abdominal segments are ornamented with similar patches of hairs; on the seventh the hairs form a narrow transverse band; the anal segment slightly cleft at the tip.

General Description of Beetle.

The beetle has a groundwork of pitchy brown colour, but the whole insect is so thickly covered with a yellowish grey pubescence that the dark ground tints are only visible through the number of fine punctures in the upper surface. These impressed black pits form patches on the head and thorax, but are thickly and somewhat irregularly scattered all over the slightly crenulated wing covers. Average length, 1 inch, but sometimes a third longer.

Suggestions for Checking the Damage.

Painting the stems of the passion-vines with a lime and sulphur wash from October to January might keep the beetles from depositing their eggs in the bark. As the eggs are deposited in the bark on the main stems during this period, a man on the watch for them should be able to detect the cut made by the beetle when depositing the egg in the bark, and so could destroy them before they get deep into the tissue. Local infestation is often caused through a dead or dying tree, either fallen and cut up or left standing, in which the beetles deposit their eggs. When fully developed, the beetles emerge, and looking for a host plant, lay their eggs upon the first suitable native or cultivated plant. On this account such dead timber is often a serious danger to an orchard or garden.



The Passion Vine Longicorn Beetle (*Monohammus fistulator*).

1. Larva of beetle. 2. Pupa. 3. Dorsal view of beetle. 4. Showing damage caused to a stem of a passion vine by the larvæ

Points in Selection and Management of Breeding Birds.

A. L. WYNDHAM, Poultry Instructor, Hawkesbury Agricultural College.

A HOUSE cannot last without a foundation. Neither can a breed of fowls. The constitution, or the inherited capability to stand hardship and to resist disease; the stamina, or the power of the individual to endure the strain of egg-production; the vigour, or the amount of energy possessed by each bird; the size, giving sufficient capacity to produce eggs and provide a fair market bird, and to check the inherent tendency towards small size; and finally, the recognised shape or type of the breed, are points of first importance.

Bird which have been badly incubated or reared, having been overcrowded, badly housed or fed, or not separated sexually at an early stage, may apparently have constitution, stamina and vigour, but not in the real fullness of the properly-raised fowl. The external characteristics of constitution are a well-balanced body, with good length of back from the neck hackle to the rise of the tail feathers, and good depth from the back to the point of the breast bone in the front (perpendicularly through the bird), legs well set apart, medium stout shanks and beak. This is independent of condition, *i.e.*, the amount of meat on the breast-bone, the lustre of the plumage, and the general health of the bird. Stamina cannot be identified by characteristics, but accompany sound constitution. Vigour can be recognised by the general bodily activity of the bird, the frequent crowing of the cock, the chuckle of the hen as she bustles about, and the possession of bright, prominent eyes.

There is considerable divergence of opinion on the matter of size. We know that the medium-sized bird is of most value to the industry, because of the natural tendency to smallness, and the necessity for capacity to produce and to reproduce. Medium size may be secured without coarseness of bone and tissue, which is fatal to egg production; any introduction of new blood to build up size must always be from the female side.

Adherence to Type.

The minimum weights recently agreed to by the National Utility Poultry Association of Australasia are about as near as we have got to an expression of opinion by our poultrymen as to what constitutes the margin of safety in size.

The type or shape of the body is the next point which should have attention, and it is a very hard matter to persuade some poultrymen that an adherence to type is in any way desirable or advantageous. The misunderstanding appears to lie in the fact that though an adherence to strict type is desired, the objective must be approached progressively. Many pictures and photographs of birds are of typical specimens badly posed. Moreover, few of our judges are entirely agreed on similarity of type for any breed, and, although the difference may be negligible, it is often sufficient to mislead. Our minor shows are sometimes responsible for further misunderstanding, in that first prizes are allotted to the best birds in the show, whereas the recipients may be only second-class birds. A further cause of trouble may ensue when the beginner gets good typical stock on both sides, and encounters the usual variation. He is then likely to fall back on the easy way and say "any fowl is good enough for me so long as she lays eggs." The illustrations in Mr. Hadlington's "Poultry Farming in New South Wales" are good enough for fancier and for utility man alike. These are not only shown as the results of his experience, but they are proved birds. This working towards correct type need not cause any poultry-farmer financial loss, he can keep his variation specimens, the so-called laying type, for laying, but if he breeds towards correct type, avoiding largeness of size, coarse bone and skin and superficialities—such as excess of fluff and other minor desirable show points—he is going to have the so-called laying type beaten all round in a few generations.

Small size or departure from type in Mediterranean, Asiatic, or Siberian races of fowls means deterioration or foreign blood, and in any of the manufactured breeds, such as Orpingtons or Wyandottes, it means deterioration or mongrelism. It may be argued that a made breed is a mongrel production from the start. It certainly is not a species or sub-species; but years and years spent in breeding towards a definite type have practically set up purity of blood, or, at any rate, have so fixed certain characteristics, that they will reproduce regularly in the progeny, if safeguarded. But breeding from birds which distinctly favour any of the intermixed breeds in type, and of which variation will sometimes give specimens, will produce mongrelism or uncertainty as to the reproduction of characteristics.

Egg-production does not suffer very often in the first generation in such cases. Coincident with the progeny of first crosses there is often an increased vitality, evidenced in a larger egg yield, but we should breed for continued egg-production year after year, by careful selection of the vigorous hens with plenty of stamina—not for artificial heavy production that only lasts a generation or two, and that presently leaves us with a production that does not show a profit over loss in hatching and rearing. While no brief is held for line breeding, this practice, or very painstaking search for desirable specimens with a view to introducing new blood, is the only means of carrying on. The practice needs to be continued with a testing out of the new blood for at least one generation before its introduction into the strain. A born breeder might mate specimens showing considerable variation in type from each other, with some hope of securing a small percentage of true-to-type progeny, but born breeders are few and far between. Presumably, too, the breeder would not adopt such a course without some knowledge of the parents and grandparents of the birds utilised.

Selection for Egg Production.

In placing selection for egg-producing capabilities as the third point of selection, the most important point is the influence of the sexes in the transmission of that desirable characteristic. We believe the largest inheritance is dual; but whether this is the case or not, it is undoubted that a cockerel's influence on the next generation must be greatest, as he is related to all the progeny, while the pullets are only related to their own progeny. On general principles, bright-eyed, active birds, without coarseness of bone and fairly close feathering, should be selected as layers, avoiding a tendency to stiltiness or a squat appearance. An active, early-hatched cockerel from a hen that lays up-to-weight eggs should be chosen, because this desirable trait is capable of transmission.

Selection for Colour Reproduction.

We may next deal with the question of selection for colour reproduction. While there are many variations of colour, due to characteristics that are inborn, and different ways of obtaining the same colour, the most that space will permit is a reference to some of the general rules. Although, from description, we know that practically all colours existed in the original four species of the jungle fowl, it may be taken that black and red were the predominant colours. Recognising these as types of colour, we must include such breeds as Black, Red and Brown, Red Game, Brown Leghorns, &c. In these the inheritance of colour is crossed from the mother hen to the cockerel, and *vice versa*. It is well to provide for a reserve of colour in the hen, by breeding from those birds that show a tendency to red in the brown of their plumage, and similarly in the cock by breeding from those that show a tendency to density and black colour, though the tendency to dense black in the pencilling of a black-red hen for cockerel breeding must be watched with care, as it will produce white under-colour.

The same colours in different patterns exist in Golden-laced Wyandottes, Golden-spangled Hamburghs, &c. Silver-laced Wyandottes, Silver-spangled Hamburghs, &c., are similar, only the white replaces the red. Clearness of lacing and spangling are then the main objectives. The tendency to black must be catered for on one side to preserve colour, while double matings are resorted to in order to obtain correctly marked specimens of both sexes in Wyandottes. At the present time there is generally a greater likeness between the marking of both sexes than is allowed by standard. For all practical purposes this coloration might now be considered correct.

To reproduce buff or red colour, selection should be made on strength and evenness of under-colour first and then on evenness of surface colour, avoiding the matings of extremes in colour which will produce black feathers or mottlings and mealiness. Black birds which have not been carefully bred for colour will show a brown-black feathering. The green sheen in some strains of black breeds has a tendency to develop a purple sheen or red feathers. But the sheen is always desirable in the cock, and a metallic black hen will check the intensification of the colour. White colour can only be bred by selection, avoiding any tendency to yellow or straw colour on back or wings. The yellow colour referred to does not mean the yellow (or sappiness) in the growing feathers.

Blue plumage may be obtained in several ways, but to go on with breeding from black and splashed white birds thrown by blue matings is perhaps the most satisfactory in results, although this depends a good deal upon the origin of both colours.

Selection for Superficial Points.

What, by rights, is the least important point in selection, is for the reproduction of superficial points, such as comb, wattles, lobes, particular poise of the tail, and certain developments of parts of the body. These points do not perfect a bird; they may finish it off and are certainly desirable from that point of view, but they are not worth obtaining at the expense of other more valuable characteristics. Large single combs may be reduced in the progeny by breeding from hens that have a comb whose first serration stands upright and the remaining serrations slope backward on the head. Very few perfect rose combs are to be seen; but as there is certainly a relationship between the comb and the rest of the body, as instanced in the improved vigour in a large-combed bird, we think it is not unreasonable to expect an improvement generally in the shape of combs with a closer adherence to type without making any special effort to secure them.

Management of Breeding Birds.

Very few birds in confinement fertilise regularly with such high percentages as those running free on a farm. The larger the run, therefore, that can be allotted to breeding birds the better the fertility ought to be, though often it is not. One important factor in this regard is keeping the male bird in fit condition. Any cock who is worth his keep will starve himself to a certain degree to feed the hens. The best safeguard against loss of fertility from this cause is to feed the cock by himself on whole maize once daily. Do not adopt the practice of running two cocks week about in the same pen; this is only begging the question.

The feeding of breeding birds is a subject about which considerable argument can be raised, but we believe the bodily condition of fitness is of more consequence, and that, all other things being equal, any ordinary ration ranging from a proportion of one part of flesh-forming material to five or six parts of heat and energy producers is suitable. The amount of green food in an ordinary ration can be increased to advantage, and the grain buried in straw or some litter to promote exercise where the yard space is 40 square feet or under per bird. No hot food should be given unless there is ice on the water troughs, and all spices and stimulants should be avoided. The amount of soft food should be less than what is ordinarily fed to hens kept for egg-production only, the general idea being not to obtain the greatest number of eggs, but the greatest number of hatchable eggs.

The best check on the condition of breeding birds is to handle them individually, say once a fortnight. As already stated, outward appearance is often deceptive. Removing a bird for three or four days to feed it up or dose it will not seriously interfere with his or her fertility. A tendency to develop internal fat may be evidenced by thickness and lack of pliability of the skin of the abdomen. Such hens will not fertilise well. The presence of insects that infest the hen's body, as well as those that infest the houses, will reduce the percentage of fertility; and if provision has been made for dusting, we think the presence of body lice indicates a hen of lazy temperament, who perhaps would be better culled out.

Adhering excrement on fluff feathers should be removed, and sometimes it is advantageous to remove an excess of fluff feathers round the vent; these feathers should preferably be plucked.

Hens to which a cock shows a dislike should be removed. An excess of activity on the cock's part, or hens becoming bare on the back, shows that more hens are required. This may be managed by giving the cock a run with other hens, or introducing hens of another breed into the pen, where the necessary hens of the same breed are not available and the appearance of the pen need not be considered. Cocks which show no signs of activity, which show poor fertility results, and which eat greedily, are best disposed of.

In conclusion, we would add that this article has been written mainly with a view to emphasising the need of getting back to type; and so far as selection by points, as referred to, is concerned, it is to be hoped that the suggestions made will not be lightly cast aside on account of time being too valuable for them to be practised. The question is, would the time so occupied be worth more than the loss in hatching and rearing poor-grade stock from hens that should never have been put into the breeding pens?

ERRATUM.

BY a typographical error in the article on "Castor Oil," by Mr. H. Ross, Chief Inspector of Agriculture, it was stated on page 883 of the December issue, that when analysing samples of the beans, "The oil was obtained by extraction with sulphuric acid." This should have read "sulphuric ether."

LIST OF PLANTS DECLARED TO BE NOXIOUS IN VARIOUS SHIRES AND MUNICIPALITIES DURING NOVEMBER, 1918.

Plant.		Shire.	Municipality.
Scientific Name.	Common Name.		
Conium maculatum	Hemlock, or Parsley Fern.	Tumbarumba	
Echium plantagineum	Paterson's Curse	Conargo	
Inula graveolens	Stinkwort	,,	
Marrubium vulgare	Horehound	Waugoola	
Nicotiana glauca	Tree Tobacco	Conargo	
Rosa rubiginosa	Sweet Briar	Upper Hunter	
Rubus fruticosus	Blackberry	....	Dungog.
Xanthium spinosum	Bathurst Burr	Amaroo, Conargo	
Xanthium strumarium	Noogoora Burr	Upper Hunter	Dungog.

Poultry Notes.

JANUARY.

JAMES HADLINGTON.

Chicken-pox.

DURING the month a commencement should be made to protect young stock from chicken-pox, or the so-called "warts." It is not generally recognised amongst poultry breeders that this is a definite blood disease similar in nature to that of small-pox in human beings, and not, as is often imagined, due to mosquitoes, although there is little doubt that these insects aggravate the trouble once the disease has got a footing in the flock. The way in which the mosquito accentuates the trouble is probably, in the first place, by making small punctures in the skin, which admits the disease; and in the second place by causing the birds to scratch themselves, resulting in abrasions which allow the disease access to the blood.

The method of protecting young stock from this disease consists in giving them flowers of sulphur two or three time a week in the morning mash for about three weeks in succession, the quantity to use being a level tablespoonful to each fifty adult birds. Then give them Epsom salts in the drinking water at the rate of one ounce to the gallon for a like period alternately. If this is carried out faithfully from January to April little fear of chicken-pox need be entertained. February, March, and April are the months in which it is most active in this State.

Grit and Lime

While visiting country districts I have been surprised at the lack of knowledge on the subject of supplying suitable grit for poultry. Many poultry-keepers have an idea that, as grit is more or less essential for the digestion of the food eaten by the birds, any sort of grit—ironstone, quartz, or other such substances—is all that is necessary. This, of course, is wrong. In some cases they read that lime is essential for supplying shell-making material, and straightaway resort to giving them burnt lime. This action is equally wrong.

The primary function of grit is to supply shell-making material, and for this purpose none of the substances mentioned is of any use, and the burnt lime is absolutely harmful. Lime in its burnt state should never be given to poultry, nor can the practice of putting it into the water be recommended. Sea or oyster shell grit should be always available for laying hens, and there is no efficient substitute.

Should a flock of hens in full lay be deprived of shell grit such as indicated, they will soon slacken off laying, and show signs of breaking up. Many such cases are constantly coming under notice, and there are many other instances where the best results in egg production are not being obtained owing to an irregular supply of suitable grit. Either sea shell or oyster shell, crushed to a suitable size, will answer the purpose, but a combination of one-third by measure of the oyster shell to two-thirds of the sea shell appears to give the best results; given these, all purposes are served.

Factors which Govern the Lay-out of a Poultry Farm

At the present time, when there are many poultry farmers who contemplate an extension of their area, or the purchase of an altogether new and larger site for their sphere of operations, it may be desirable to refer to some of the essential points which must be taken into consideration when purchasing land for poultry-farming purposes.

The shape of the block, the area available, the aspect and the general direction of the fall, all require close attention, both before purchase and subsequently when deciding on the location of the buildings and yards.

A suggested plan for laying out a poultry farm has already appeared in the *Agricultural Gazette,* and subsequently in "Poultry Farming in New South Wales." In this it was sought to show how to lay out a farm on systematised lines. The plan was explained in detail, and the number of birds it was designed to carry was mentioned. To enlarge on this subject, there are a few general principles which might be brought out, and which should be observed in planning a farm.

Grade and Aspect.

First, it might be pointed out that it is highly desirable that the land should have sufficient fall to allow of good surface drainage; without this, adequate sanitation is impossible. Where there is a good fall in the land the yards will get washed during heavy rains, which is very desirable, particularly on clay or loamy soils, but it is a mistake to have too steep a gradient. On sandy soils of good depth perhaps this is not so important, because sand is such a good filtering agent; but the great bulk of poultry-farming is conducted on the soils of the class first mentioned. The best aspect is north-east to north.

The next thing is to so plan the arrangement of the buildings that they will not too materially obstruct the natural course of the water; it is also most important that the yards or enclosures fall away from the houses, not towards them. If placed otherwise, trouble will sure to be experienced with water running into the houses during rainstorms.

Arrangement of Sections.

The arrangement of the farm should allow of division into four main sections, as follows:—

Brooder houses, rearing pens, colony enclosures, and accommodation for laying stock.

It is important for the economical working of the farm that the sections requiring the most concentrated attention shall be grouped nearest the attendant's residence, and that the ground on which chickens are to be reared should not be in a position where wash or soakage from other portions of the farm can percolate to, or run over it. This means that both residence and chicken-rearing equipment should occupy the highest portion of the farm. Then, again, where it is not possible to arrange the colony enclosures or chicken-rearing ground on one side of the farm, as might happen in the case of the land being too narrow to allow of that plan, it will be better to arrange the sections in the following order down the hill:—First brooder houses at the top, next come the rearing pens, then the colony enclosures or growing ground, and lastly the accommodation for adult stock. The reasons for this should be obvious. Very little objectionable matter will be washed from the top to the bottom, and during a large portion of the year none at all. Not only so, but the adults are much less susceptible to disease due to insanitary conditions than is the case with young stock. In the case where, as in the plan referred to, the adults occupy one side of the farm and the young stock the other, the latter should always occupy the highest side of the farm. To suit the houses to the aspect, and to face adult poultry-houses north, it may be necessary to build the front to the passage or the reverse way.

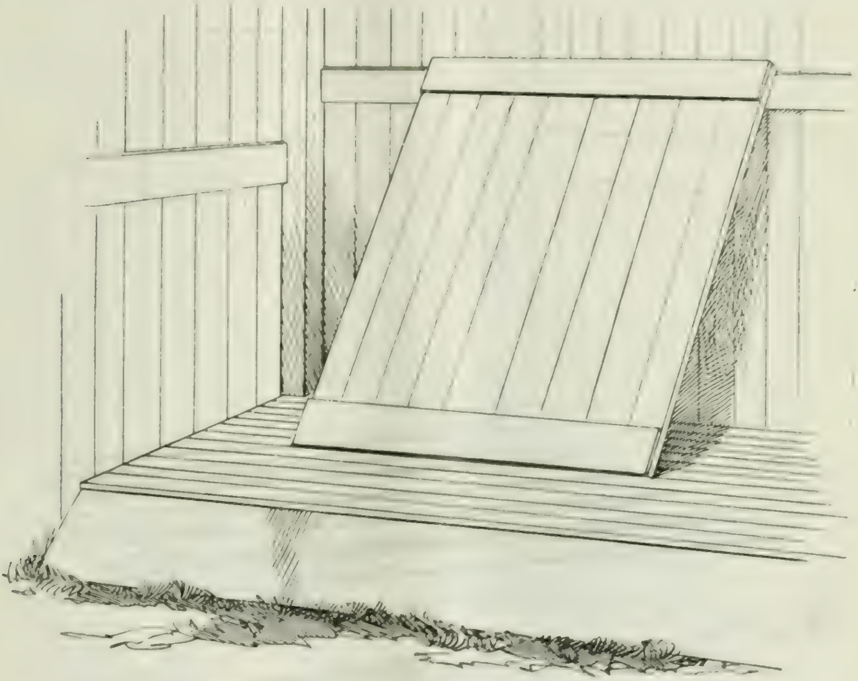


Fig. 1.

Another matter of importance is that the best site for a poultry farm (other conditions being equal) is land in its virgin state, while among the worst is land that has recently been cultivated, particularly if without sufficient fall. Poultry farmers will do well to refrain, as far as possible, from disturbing the soil either in or round the yards. The reasons for this have already been stated; but for the benefit of those who have not read them, it might be said that digging up yards is simply preparing disease-conserving beds. The notion that cropping poultry yards sweetens the soil is only partially sound. Cultivating does not destroy, but helps to preserve, some of the worst enemies of the poultry yard.

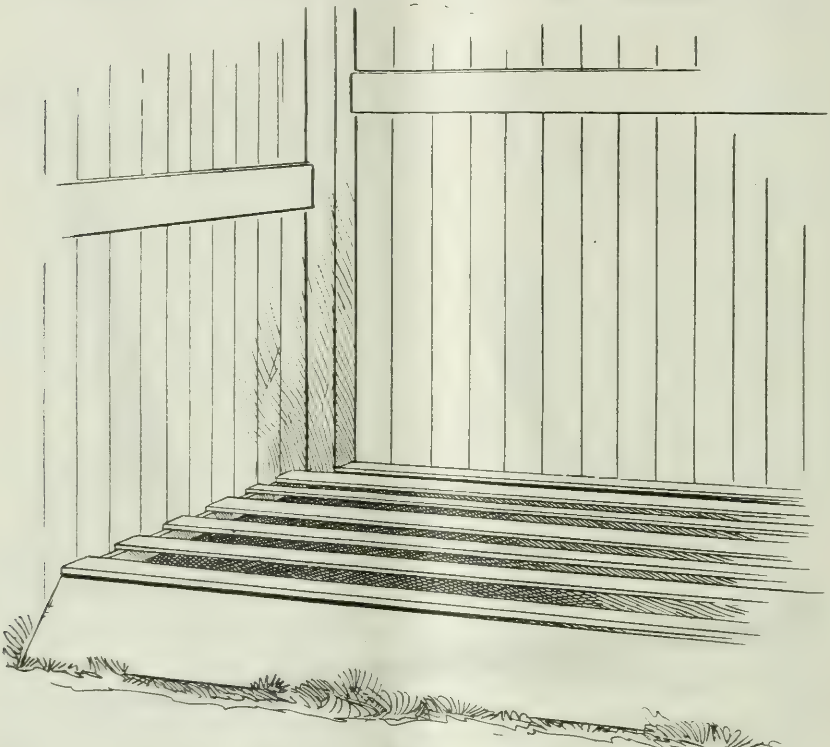


Fig. 2.

Inducing Chickens to Roost.

The poultry farmer who is handling chickens in large numbers scarcely needs to be told of the advantages accruing from getting his chickens to roost at an early stage. The matter has already been referred to in these notes (October, 1917), but the matter needs repetition, as arrangements can be made during the slack period to get the platforms ready for the coming season.

It is not cold that hurts the chickens, but the consequences attendant upon crowding together. It therefore follows that the sooner chickens learn to roost, other things being equal, the better, for a more satisfactory development will be obtained, and the risks of sweating and of disease will be minimised.

A good way of getting over the difficulty and of teaching the chickens to roost at an early age is to make a portable platform, composed of 3-inch x 1-inch hardwood battens laid (without fastening) on cleats 6 inches from the floor of the house (see Fig. 1). Twelve of these battens will make a platform 3 feet wide by the width of the house (viz., 6 feet). On this platform the chickens are made to camp. A board is placed in front to act as a ramp, and to prevent the chickens from getting underneath.

In cold weather a cover-board, 4 feet x 3 feet (seen in the illustration), is set at an angle of about 45 degrees on the platform and leaning against the partition or end of the house. The chickens are induced to camp under this cover-board for the first few nights to wean them from the warmth to which they have been accustomed in the brooders. Afterwards the board is dispensed with, and the chickens left camping on the platform.

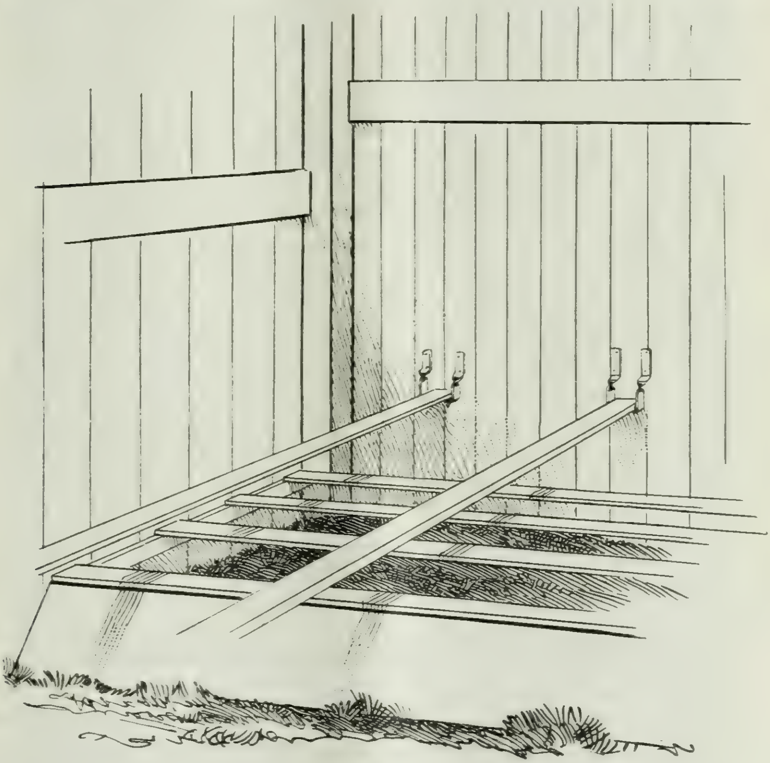


Fig. 3.

A commencement is then made to take out the battens, one or two at a time, and evenly spacing those that are left, until the one-time platform appears as a series of roosts, as in figure 2; and later on as in figure 3, when the ordinary roosts are put in above them and the lower ones finally taken out.

In this system only some of the houses need to be fitted up in the manner described, because as soon as the chickens have learnt to roost they can be transferred to other houses fitted only with ordinary roosts.

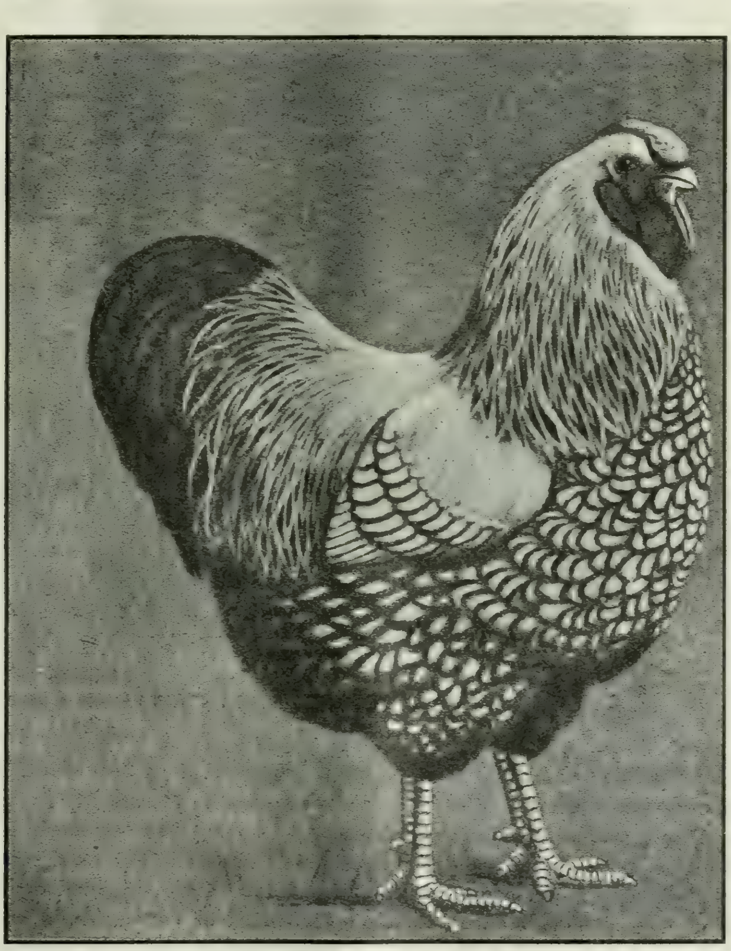
This system was designed to meet the conditions at the Hawkesbury Agricultural College demonstration plant, and has proved very effective. It can therefore be recommended for general application.

Breed Standards.

During the next four months poultry-keepers will be on the lookout for any new stock they intend to introduce into their yards. There are, unfortunately, many to whom standards for the breeds they are keeping are a sealed book. They have not deemed it necessary to study the standards, and until recently, the necessity for such knowledge has not been brought home to them ; and the average utility farmer was wont to boast that the standards for the breeds were a matter of indifference to him, and that all he wanted was eggs. This might have gone on indefinitely without losing the identity of the different breeds so long as their flocks were being recruited from the yards of breeders of standard birds ; but as time has gone on the effort to secure high-laying qualities has resulted in most flocks being recruited from yards where the owners had won honours in laying competitions, or where the birds were reputed to have high-laying qualities. In many cases little regard was paid to standard requirements of the breeds, the one object being eggs. The effect of this has been much the same as if the objective had been any other single characteristic ; for instance, if the objective had been meat, every other consideration would have been subordinated to size, with the result that there would be great danger of diminishing the egg-laying capacity, and of losing the identity of breeds such as the Leghorn, for instance. This striving for a single objective, without due regard for the bird as a whole, by the exhibition breeders has brought about the downfall of many good breeds of fowls, at any rate to such an extent as to put them out of the running as a commercial proposition. For this, weak and faddist judges have been primarily responsible, inasmuch as they have followed the popular craze for an exaggeration of one or more points at the expense of others, which would never have occurred had the standard been strictly and properly interpreted by them.

Experience proves that there is no necessity to sacrifice standard requirements to obtain the highest egg production. Many notable performers in this direction have been good standard birds. What is wanted is a working knowledge of the standards by the utility poultry breeder, and particularly those who essay to become suppliers of stud stock. The result of the lack of this knowledge is to be seen on every hand in the lost character of the breed, and it has taken almost the loss of the identity (except in colour) of the different breeds to arouse the utility poultry farmer to the danger ahead. However, a change is coming, and the adoption of standards for utility birds by the National Utility Breeders' Association is a sign of an awakening to the necessity for preserving the breeds, and the forty points that form the groundwork of that standard make it imperative that this matter receive due consideration.

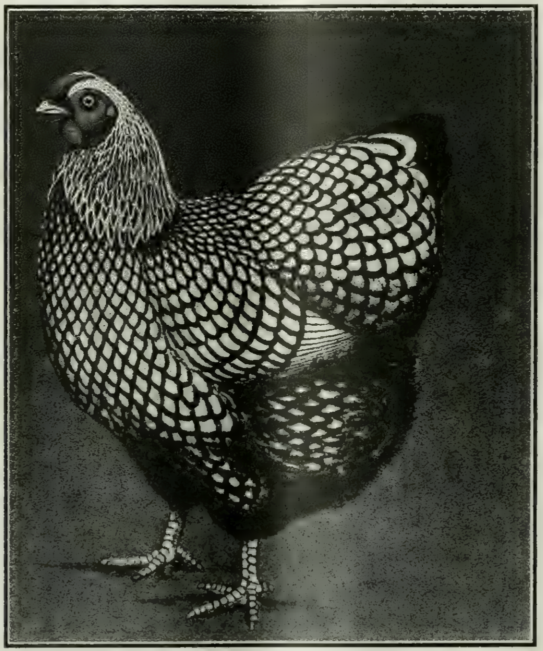
If birds are lacking in the essentials made up by those forty points, good scoring in the other sixty points is scarcely likely to carry a bird in the utility section to the coveted honours, and the time has come when the poultry farmer who aspires to sell stud stock can no longer altogether ignore standard requirements. It is not that he will be expected to breed standard show specimens, but he certainly will be expected to breed birds of a fair standard of breed character.



Silver Wyandotte Cock.

For some time now, owing to war conditions, the English Poultry Club and other standards have not been readily available to meet requirements. Standards for the breeds White Leghorns, Black Orpingtons, and Rhode Island Reds, together with illustrations by the writer, have been published in the *Agricultural Gazette,* and subsequently in "Poultry Farming in New South Wales." An addition to this was promised; and in fulfilment of that promise, illustrations of Silver Wyandottes, Plymouth Rocks, and Croad Langshans have been prepared, and are here produced with the standards.

The scales of points are not published for the reason that in the writer's opinion a revision of these scales is urgently needed in the direction of giving more value to essential utility and less to fancy considerations. This matter is earnestly commended to the Poultry and Pigeon Club of New South Wales.



Silver Wyandotte Hen.

STANDARD FOR SILVER WYANDOTTES.

COCK.

Head.—Skull: Short and broad. Beak: Short and well curved Eyes: Of medium size. Comb: Rose, firmly and evenly set on the skull, low, square-fronted, and gradually tapering toward the back, and terminating in a small but well defined spike or leader, which should follow the curve of the neck, and without any upward tendency, the top oval and covered with small and rounded points, the side outline of the comb being of convex shape, curving to conform to the shape of the skull. Face: Smooth, and of fine texture. Ear-lobes: Of oblong shape, well developed and smooth. Wattles: Of medium length and fine texture, and well rounded.

Neck.—Of medium length, and abundantly covered with hackle.

Body.—Short, deep, and round. Breast: Broad and round, with straight keel. Back: Broad and short. Saddle: Full and broad, and rising with a concave sweep to the tail. Wings, of medium size and well folded. Sides well rounded. Fluff: Full and abundant.

Tail.—Well developed, spread at the base, the true tail feathers carried rather upright, the sickles of medium length.

Legs and Feet.—Legs: Of medium length, the thighs well covered with soft and webless feathers, the shanks strong, fine, and well rounded, and free of feathers or fluff. Toes: Four on each foot, straight and well spread.

Carriage.—Graceful and well balanced, resembling that of the Brahma.

Weight.—8½ lb.*

HEN.

The general characteristics of the hen are similar to those of the cock, allowing for the natural sexual differences.

Weight.—7 lb.*

SERIOUS DEFECTS.

Any feathers on shanks or toes; permanent white or yellow on ear-lobe, covering more than one-third of its surface; comb other than rose, or falling over on one side, or so large as to obstruct the sight; wry tail; deformed beak; crooked beak; shanks other than yellow, except in adult cocks and hens, which may shade to light straw; white in tail, or any conspicuous spotting or peppering on ground of the feathers.

STANDARD FOR PLYMOUTH ROCKS (BARRED).

COCK.

Head.—Skull: Strong, but not thick. Beak: Short and stout. Eyes: Large and bright. Comb: Single, of medium size, straight and erect, with well defined serrations, and free from side sprigs. Face: Smooth ear-lobes, of fine texture, well developed and pendent. Wattles: To correspond with size of comb, and moderately rounded.

Neck.—Of medium length, thick and profusely covered with hackle feathers which should flow well over the shoulders.

Body.—Large, deep and compact. Breast: Broad, and well rounded. Back: Broad, of medium length. Wings: Medium size, carried well up, the bows and tips covered by the breast feathers and saddle hackles.

Tail.—Rather small, rising slightly from the saddle, the sickles and coverts of medium length, and nicely curved, the coverts being sufficiently abundant to cover the stiff feathers.

Legs and Feet.—Legs: Wide apart, stout and strong, thighs 2 to 3 inches ong (from hock to body), with shanks to correspond.

Toes.—Four on each foot, strong, straight, and well spread.

Carriage.—Upright and graceful.

Weight (American).—Cock, 9½ lb.*; cockerel, 7½ lb.*

HEN.

The general characteristics of the hen are similar to those of the cock, allowing for the natural sexual differences.

Weight (American).—Hen, 8 lb.*; pullet, 6 lb.*

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* See subsequent note with regard to weights.

COLOUR.

Beak.—Bright yellow. *Eyes.*—Clear rich bay.

Comb, Face, Ear-lobes and Wattles.—Bright red.

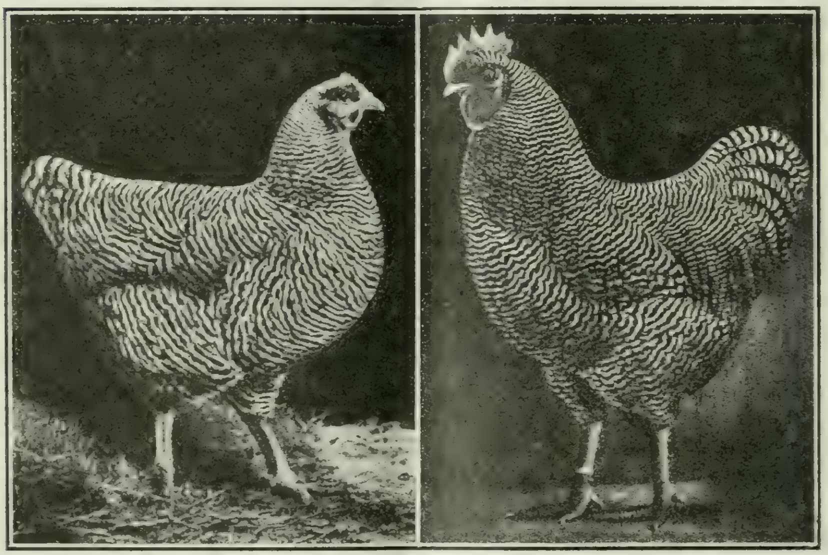
Legs and Feet.—Bright yellow.

PLUMAGE.

Blue-white ground, each feather barred across with bands of black of a beetle-green sheen, the markings to be moderately narrow and of equal width, and the colours to be sharply defined, and not shading into each other. The barring to continue through the shafts of the feathers and into the fluff and under-colour, and each feather to finish with a black tip.

SERIOUS DEFECTS.

The slightest fluff or feathers on the shanks or feet; shanks other than yellow; white ear-lobes; black, red, or white feathers.



Plymouth Rocks (Barred).

STANDARD FOR CROAD LANGSHANS.

COCK.

Head.—Skull: Small, and full over the eyes. Beak: Fairly long and slightly curved. Eyes: Large. Comb: Single, medium size, straight and upright, free from side sprigs, evenly serrated with five or six spikes (five preferred), of fine texture. Face: Smooth, and of fine texture. Ear-lobes: Well developed, pendent, and of fine texture. Wattles: Rather large, and of fine texture.

Neck.—Of medium length, and with full hackle.

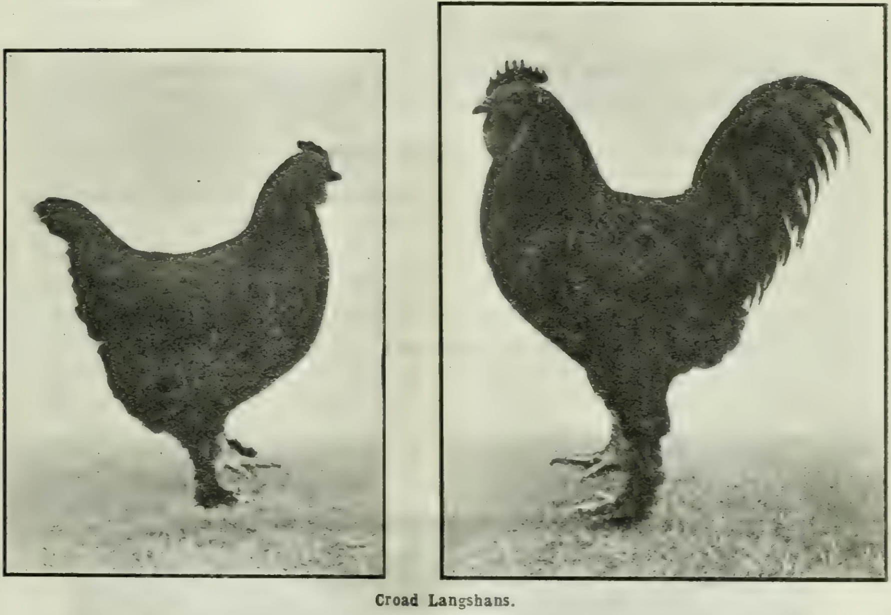
Body.—Back: Broad, of medium length, flat at the shoulders, and the saddle rising abruptly to the tail, the saddle being abundantly furnished with hackles. Breast: Deep and well rounded, with a long breast bone, and the keel slightly rounded. Wings: High or low, the latter more usually.

Tail.—Fan-shaped, carried rather high, with plenty of side hangers, and the two sickle feathers some 6 inches or more beyond the rest.

Legs and Feet.—Legs: Thighs rather short, and covered with soft feathers; shanks of medium length, small boned, standing well apart, and feathered down the outer sides (not too heavily nor scantily). Toes: Four, long, straight and slender, the outer toes being feathered.

Carriage.—Graceful and extremely active.

Weight.—9 lb.*



Croad Langshans.

HEN.

With the exception that the fluff should be rather more abundant, the general characteristics are similar to those of the cock, allowing for the natural sexual differences.

Weight.—7 lb.*

COLOUR.

Beak.—Light to dark horn. *Eyes.*—Brown to very dark hazel, the darker the better. *Comb, face, wattles, and ear-lobes.*—Brilliant red. *Legs and feet.*—Blue-black, showing pink between the scales, the web and bottom of the feet pink white (the deeper the pink the better) and toe-nails white.

Plumage.—Dense black, with a brilliant beetle-green gloss and free from purple or blue tinge.

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* See subsequent note with regard to weights.

SERIOUS DEFECTS.

Yellow legs; yellow at base of beak or around eyes; five toes; permanent white in ear-lobes; slate or blue legs in young birds; white feathers in adults; coloured feathers; decided blue or purple sheen or barring; white tips to feathers; brown or black patches on toe-nails; white in shank and toe feathers; wry tail; lop comb; side sprigs.

Comments on Standards of Weights.

As stated in connection with other breeds, I think that, as far as Australian conditions are concerned, the weights quoted are somewhat excessive. I prefer weights as follows:—

SILVER WYANDOTTES

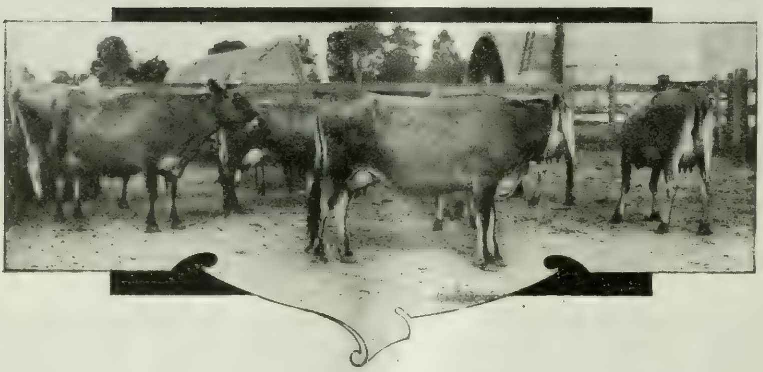
Cock, 7 to 8 lb.; hen, 5 to 6 lb., at 12 months old. Cockerel, 6 to 7 lb.; pullet, 5 to 5½ lb., at 7 months old.

PLYMOUTH ROCKS (Barred).

Cock, 8 to 9 lb.; hen, 6 to 7 lb., at 12 months old. Cockerel, 7 to 8 lb.; pullet, 5 to 5½ lb., at 7 months old.

CROAD LANGSHANS.

Cock, 8 to 9 lb.; hen, 6 to 7 lb., at 12 months old. Cockerel, 6½ to 7 lb.; pullet, 5 to 5½ lb., at 7 months old.



VINEYARD NOTES FOR JANUARY.

THIS month will see the earlier varieties of grapes ripening and coming on to the market. At the same time, later varieties will be developing rapidly and active growth of the vines will have almost ceased for the time being. The whole energy of the plant will be put into the maturing of the fruit.

Development of the berries at this stage depends upon the supply of moisture in the soil, and therefore every means should be employed to ensure a regular supply. In non-irrigated vineyards the soil should be kept loose by constantly breaking the surface with the cutivators. Where irrigation is possible, the question of maintaining the moisture is simplified, but it by no means implies a cessation of cultivation. Rather is there greater need for cultivation in irrigated soils than in others.

Irrigation without good cultivation is a constant source of salty patches in the soil There is no greater fallacy than that irrigation does away with the need for cultivation, and the man who works upon that idea is courting disaster. The rule should be a sufficiency of water to produce perfect quality in fruit, combined with thorough cultivation in order to conserve that moisture in the soil. Best results are obtained where there is no check in the development of the grapes from the time of setting until ripening.

Diseases.—Generally speaking, vine diseases have been conspicuously absent during the present season, and although it is still possible that an outbreak might occur, the longer this is averted the less likely it becomes.

The danger will arise with a change in the weather to damp and humid conditions. Should such conditions arise there is every likelihood of Black Spot and Downy Mildew again making their appearance.

The main danger of infection lies with the green berries and the young growth which may develop, but once the berries begin to colour and develop sugar, the danger is past. In the case of Downy Mildew it sometimes happens that the whole of the leaves are shed, leaving the fruit exposed to the sun. Upon the fruit it is indicated by the green berries becoming discoloured, going soft and pulpy, and falling from the bunches. Should showery weather be experienced, it would be a wise precaution to spray the vines with Bordeaux or Burgundy mixture, repeating at intervals of six or seven days.

Summer Pruning.—This implies more or less interference with the vegetative functions of the vine. As all such operations are weakening in their effect upon the vine, they should be used with caution. The removal of useless and unfruitful growths which may be crowding the foliage is a good plan, as it opens out the vine, admits light to the fruit, and throws the sap into useful portions of the vegetation.

The practice of indiscriminate topping is not to be recommended. It is an old fallacy that by cutting back the growth, the sap is concentrated in the fruit. The vigour of a plant depends primarily on its leaf surface. The leaves of the vine, amongst their other functions, elaborate the sap for the whole plant, and are responsible for the accumulation of sugar in the fruit. Therefore, unless for special reasons, topping is best left alone.—H. E. LAFFER, Viticultural Expert.

Agricultural Bureau of New South Wales.

Greetings for 1919.

It affords me pleasure to congratulate the members of the Agricultural Bureau upon the wholehearted interest taken in the movement during the past year, and the success that so far has been achieved.

Several new branches have been established, and a large number have exhibited consistent activity.

The usefulness of the institution is sufficiently manifested by the reports of the meetings which appear in this "Gazette" from time to time.

Now that it can be assumed the War is terminating satisfactorily, we may expect the return at an early date of a large number of the young farmers who responded to the call to the colours, and a period of greater activity in the near future.

Field officers of the Department now on active service will also be returning to duty, and it will be possible to assist Branches in a larger measure by arranging more lectures and demonstrations than during the past three or four years.

On behalf of the Minister for Agriculture and the Departmental staff, I offer to all members of the Bureau the Season's Greetings and best wishes for the coming year.

George Valder

Under Secretary and
Director of Agriculture.

Sydney, 2nd January, 1919.

Agricultural Bureau of New South Wales.

Suggested Subjects for Bureau Meetings.

It sometimes happens that, owing to some inadvertence, or perhaps the failure of the writer of a promised paper, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion :—

> In what respects has the past season altered your ideas about varieties of wheat—(*a*) for grain, (*b*) for hay, (*c*) for dual purposes? In the case of the long-season varieties, like Marshall's No. 3, Yandilla King and Rymer, what seems to have been the best sowing season? In quite a number of places Canberra has yielded better than anything else; had you any similar experience with a quick-growing wheat? In certain districts Hard Federation has equalled or excelled Federation; do you consider the former any more suitable for your purposes, especially as it has matured a little earlier and grown a little taller?
>
> What value do you attach to a ton of green feed for dairying purposes when natural pastures are bare? Have you any definite idea of the effect on the milk yield of green feed at such a time? What do you estimate to be the cost of producing fodder of that kind?
>
> What has been your experience in the feeding of chickens this past spring? Did you feed on wet mash, dry mash, crushed dry cereals, or a combination, and what have been the results as to development and percentage of losses?
>
> How often do you find it necessary to cultivate the surface in the orchard during the summer? No doubt it will vary with the seasons and in different classes of soil, but give some indication of the number of workings you generally find best. In many orchards the area hand-hoed is so great as to be an expensive item. Have you tried any implement for working a larger proportion of the orchard with horse-power; has the result been satisfactory as to the soil, and what has been the actual saving?

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Bankstown.

On 18th November a lecture was delivered by Mr. A. A. Hamilton, in which a general outline was given of the activities of the Department of Agriculture, and of the Herbarium in particular. It was explained that specimens of plants indigenous and exotic are identified at the National Herbarium, and information is supplied in respect of their properties, especially to people engaged in agricultural pursuits. Attention was drawn to the information available on pasture grasses and fodder plants, on reputedly poisonous plants and weeds and their eradication, the cultivation and management of oil-yielding and other commercial plants, growing of medicinal herbs, examination of the contents of birds' stomachs for traces of vegetable products, testing of seeds for germination, and their examination for impurities, &c. The confusion in the nomenclature of plants was discussed, and advice was tendered to the members upon the preparation and method of forwarding specimens. The work of other branches of the Department was also briefly referred to.

Bimbaya.

The members met on 26th November, when a useful discussion took place on white ants.

The opinion was expressed by several that white ants could not live in a building for any length of time if communication passages to the ground were cut off. Covering foundation blocks with tin was advocated, and so were brick or concrete piers, with the building well above the ground so that it could be inspected when desired. Vines, flowers, &c., which were growing near, should be removed, and the destruction of ant beds, infested logs, &c., was also recommended.

Blacktown.

At the annual meeting of this branch the Secretary's report showed that the membership stood at 109. A number of lectures and demonstrations were held during the year, to the great advantage of all who attended. The branch competed in the district exhibit competition at the Hawkesbury Show, and obtained third prize. An exhibition was also held at Blacktown during the year, which had been very successful. Other local interests of a more general character had also been advanced, and it was felt that solid progress had been made.

Buckaroo.

A meeting of members was held on 27th September, when a paper entitled "Sheep" was read by Mr. W. Walsh.

SHEEP.

At a time when wool and mutton are so valuable as now, practically every farmer should have a few sheep. They are not only valuable for their wool and meat but of great assistance in clearing paddocks of black oats and other rubbish; and if a crop is too forward they can be turned in to eat it off.

The class of sheep I prefer for the small farmer is the crossbred—that is, a cross between the English Longwool and the Merino. They are hardy, good wool-growers, and the lambs can be placed on the market early, either as fats or stores. In my opinion, either the Lincoln-Merino or the Border Leicester-Merino is the best cross. The lambs from these crosses grow rapidly, and they carry good fleeces. The Dorset Horn-Merino cross is all right for the carcase, but the lambs carry very little wool, and cannot be recommended as a useful sheep for the farmer.

It pays the man on the farm to look after his ewes well; and any ewes failing to produce a lamb should be marked, and if they fail the second year they should be cast out and fattened for the butcher, for it is useless to keep barren ewes or shy breeders. If this rule is followed, and a man looks after his lambing flock properly, he will get a good percentage of lambs.

The ewe usually carries her lamb about 180 days. After being served by the ram the ewes should be kept in good condition—not too fat; and about a fortnight before lambing commences they should be crutched and turned into the lambing paddock, which should have good green feed in it, if possible, so that they will have a good flow of milk when the lambs come along.

The lambs should be marked and tailed when three to six weeks old; at any rate, they should not be over eight weeks, for then there is more danger, and the operation seems to retard their growth. In this district ewes should not lamb before the 1st September, as the weather is then likely to be mild and good feed to be available.

Sheep should always have plenty of salt, and it is a good plan to add a little sulphur, Epsom salts, or turpentine occasionally.

Sheep should be dipped every year, as it improves the wool, and they do much better if free from lice and ticks.

Cardiff.

The annual meeting was held on 2nd November. There was a large attendance, and the following were elected as office-bearers for the ensuing year:—Chairman, Mr. A. Barrett; Vice-Chairman, Mr. E. Rowe; Treasurer, Mr. G. Watson; Hon. Secretary, Mr. J. G. Marshall; Assistant Secretary, Mr. J. Cockburn.

At a meeting held on 16th November a discussion on the peaches most suitable for the district lasted two hours, and was very interesting to old growers and new settlers. The following were the varieties favoured by the meeting:—Governor Rawson, Edward VII, Bell's November, Greeensboro, Carmen, Wiggins, Mountain Rose, Elberta. Anything later than Elberta was said to be very liable to attack by fruit-fly.

Cattai.

Mr. W. W. Froggatt, Government Entomologist, delivered an interesting and instructive lantern lecture before the members of this branch on 25th October.

The lecturer treated each local pest particularly fully, describing the life histories and the usual means of combating their increase and ravages, and at the close was accorded a very hearty vote of thanks.

Coradgery.

The annual meeting of this branch was held at Adavale on 23rd November, but owing to an early harvest the attendance was not large. A satisfactory balance-sheet was presented to the meeting, and the report was read by the Chairman. The election of officers resulted in the old officers being reappointed, viz.:—Chairman, Mr. W. E. Taylor; Vice-Chairmen, Messrs. G. Tanswell and J. Clatworthy; Treasurer, Mr. H. M. Marriott; Hon. Secretary, Mr. W. L. Brown.

Cordeaux-Goondarin.

At a meeting on 13th November a paper was read by Mr. G. H. Walker, of which a summary follows:—

CONSERVATION OF TIMBER.

When in 1788 a small fleet of English ships landed their crews and passengers on the thickly-wooded shores of Port Jackson, a wealth of timber confronted them, but in the short space of 130 years the land, to a very great extent, has been denuded, and our daily newspapers report the sitting of a commission inquiring into the shortage of hardwood timbers. Great areas of land in Australia are bare of forest growth, the timbered portion being mainly on the Pacific coast. There is in our own State some 15,000,000 acres of forest country, much of which has been wantonly and ignorantly wasted.

With only 1,250,000 of population we are now short of wood, and much is being imported, or would be were shipping available. Only within the last year or two has any conservation staff been at work.

What is the value of forest land? This is a large question, but a few headings may be mentioned. First, its influence upon weather conditions—where no timber is standing we have desert, arid, sunburnt, wind-swept country. The cradle of the human race (Arabia, Mesopotamia, and Egypt), which must have been heavily timbered and carrying immense populations at one time, is now a barren and unfruitful waste. In New South Wales, by the cutting of the pine scrubs and the felling of those useful fodder trees, the mulga, gidyah, and saltbush, many thousands of acres have been spoiled. Forest land also cools the atmosphere, conserves moisture, prevents flooding and washing of soils, and tends to condense passing clouds into rain.

Second, the influence upon health.—Forest land has a purifying effect upon the air; the leaves breathe in carbonic acid gas and exhale oxygen.

Third, the usefulness of forests to the industries of a country.—Without timber no land can flourish. The fencing of large and small areas, mining, bridge-building, railway sleepers, &c., and the thousand-and-one uses to which it is put, to the profit and convenience of mankind, may be mentioned under this heading.

In the present huge demand for metals for war purposes, wood is again coming into use for shipbuilding; and had we been as well supplied as is America we might have set a record, instead of playing with the question, as we have done for the past four years.

Germany was one of the nations that early took up the study of forestry and reafforestation. Sweden followed, and private owners there may not cut for sale any timber under certain sizes. The forester, a Government official, is always at call to give advice as to what timber to cut and its value. A bonus of 12s. per acre is given to private owners to plant, cultivate, and care for the trees while growing; the timber belongs to the planter, and the thinning-out, which is sold for firewood and such purposes, is only cut under the ranger's supervision. The forest area in New South Wales is only 7½ per cent. of the total area; and the 5,000,000 acres proposed to be dealt with under the 1916 Act only gives 2½ per cent.

The areas marked out in other countries are: New Zealand, 25 per cent.; France, 17 per cent.; Germany, 26 per cent.; Sweden, 25 per cent.; United States of America, 24 per cent.; Canada, 17 per cent.; and Japan, 19 per cent., showing that the imperative need is being recognised in other countries, and it will soon be found neecssary in this country to take up the work in an extensive way.

The restoration of bare areas and of forest areas is effected by afforestation and reafforestation. The first deals with bare lands, and the other with land that has been cut over. Either the land is ploughed and seed drilled in, or trees raised in a nursery are planted. The trees are planted from 8 to 12 feet apart, and are thinned out when they begin to crowd each other. The close planting causes the trunks to grow straight, the trees reaching up, as all plants will, to the light. April to July in the coastal districts is found to be the best time, early planting giving the trees a good chance to establish themselves before summer. The land should be made secure against rabbits and stock. Strips about 4 feet wide should be ploughed, if possible; light cultivation with a hoe for a year or two will be beneficial. In many instances the land will reafforest itself.

Apart from the profits to be made from a well-cared-for forest, there is an item in the waste timber. It may be too far from market to be sold for wood pulp; but according to experiments lately made in the way of distillation of wood products from waste timber, 1 ton will, on an average, yield, when carbonised in an iron retort, charcoal 30 per cent., pyroligneous acid 50 gallons, wood-tar 5 gallons, pitch 10 lb. These are the crude products. Under chemical treatment they yield acetate, acetone, and wood alcohol. This system, once established in a central position, could be carried on wherever any large quantity of timber is felled. The surplus waste being used in this way would clean up the floor of the standing timber and would lessen the risk of bush-fires.

Again, there is the beautifying of the surroundings of the home and the growth of break-winds. This may be done with trees that will be beautiful in their foliage and profitable in their products. The *Quercus* family (oaks), some producing acorns, some cork, some quick growing, number 300 known species, adaptable to all situations and all climates; some are deciduous, like the British oak (*Quercus robur*); many are evergreen; some grow on the rocky soil of Spain, and some, like *Cyratus* and *prinus* and *aquatica*, thrive in marshy places. One writer, Sydney Jephcott, says that the willows have great value as reserves of fodder, but against that may be set the worth of the acorns that fall like hail-stones every autumn, even from very immature trees.

Under common oaks one will see a deposit of acorns 2 inches deep. By the expensive processes of ploughing, harrowing, and drilling in peas, and then harvesting and threshing, we may get a return of 20 cwt. of the best hog feed per acre. By planting the same acre with common oaks we will get a similar weight of acorns in eight or nine years, and in twenty years tenfold that return, with no danger of failure of crop.

Then there are the handsome ornamental trees, the American red oak, *Q. coccinea* and *Q. rubra*, whose foliage in the autumn for some weeks is a mass of beauty, with leaves of red, amber, and ruddy browns. The cork oak, coming from a hotter and drier climate than our own (Spain and North Africa), gives a perennial foliage, a yearly crop of acorns, and every seven years a cutting of bark for cork-making.

Another phase of interest to us as orchardists, apart from timber for case-making, is the fact that the forest is the home of birds, which decrease the pests that are inimical to us. In America, Arbor Day is one of the great school institutions. Provision for its observance has been made in every State. In Pennsylvania 30,000 trees were planted in one day; in North Dakota a subsidy in the shape of remission of taxation is paid to any person who will plant and keep in growing condition from 1 to 2 acres of timber.

Dural.

At the usual monthly meeting of members in December a discussion took place on the question on fruit subjects in the November issue of the *Agricultural Gazette.* The Secretary reports that this innovation was welcomed by his branch, and the opinion was expressed that it should be productive of good results.

Garra-Pinecliff.

The annual meeting of members was held on 24th October, at the residence of Mr. H. Robards. There was a good attendance. The annual report showed that the branch was in a good condition. The Treasurer's balance-sheet showed a credit balance of over £2. The branch held eleven meetings during the year, and eight new members were secured, making a total of thirty members.

The election of officers for the ensuing year resulted as follows:—Chairman, Mr. W. Forrester; Vice-Chairman, Mr. H. Robards; Treasurer, Mr. S. Robards; Hon. Secretary, Mr. S. W. Packham.

During the afternoon a milk-testing demonstration was given by Mr. Pedersen, Dairy Instructor, who also pointed out the good and bad points of a milking cow. In the evening Mr. Pedersen gave a lecture on dairy cattle, which was illustrated by lantern slides, showing the best cows and bulls produced in the State. The lecture was very much appreciated by all present.

A meeting was held on 21st November, when the Secretary exhibited an interesting collection of lady-birds, showing them in three stages, and explaining their habits and what they lived upon. Peach trees that had been fairly infested with peach aphis were said to have been cleared, the lady-birds being found crawling all over the trees. They are also eating the woolly aphis from apple trees. He had also noticed them in places in the grass where there was no stock. After mowing the grass, the ground was covered with them.

Inverell.

At the November monthly meeting (Mr. G. H. Arkinstall presiding) arrangements were advanced for the branch's exhibit at the forthcoming Inverell show.

Jilliby-Dooralong.

The annual meeting was held on 18th October, and the election of officers resulted as follows:—Chairman, Mr. W. Russell; Vice-Chairman, Mr. C. B. Smith; Treasurer, Mr. W. Smith; Hon. Secretary, Mr. K. A. Smith.

It was decided that the branch be represented at the conference under the auspices of the Royal Agricultural Society. An enjoyable social evening was subsequently spent by members and friends.

Lidcombe.

A meeting was held on 18th November, when fifty-six members were present. A lecture was given by Dr. Greig Smith on soil bacteria. The methods adopted in the hatching of microbes and insects were briefly sketched, and the life history of various microbes, and the part they took in improving the soil, were all explained. At the close of the lecture a hearty vote of thanks was accorded the lecturer.

A meeting of members was held on 3rd December, when an address was given by Mr. E. Cheel, of the Botanic Gardens, on oil-yielding plants.

Mr. Cheel brought a fine collection of oil-yielding seeds, such as soya beans, sunflower, pumpkin, melon, linseed, peanut, maize, castor oil, and many other common seeds, all of which contained a large percentage of valuable oil. Mr. Cheel considered this was the time when we should be looking for ways and means of obtaining from the land more money than during the last few years. Only enterprise in the way of industry, manufacture, and machinery to create new businesses was required to that end.

The address was much appreciated by the members, who subsequently asked many questions.

Matcham.

Mr. W. le Gay Brereton, Assistant Fruit Expert, gave a pruning demonstration on 5th November at Mr. A. W. Cleary's orchard. There was an attendance of about fifteen members. Citrus trees were operated on, the object being chiefly to instruct growers how to prune so that they could get a summer crop of lemons. Mr. Brereton intimated that to prune about that time would encourage the tree to throw out good growth along the lateral branches, which should blossom about January, and bear a good crop of fruit for the summer. Orange and mandarin trees were also pruned, and Mr. Brereton explained how to keep a tree well balanced and open enough to allow the air to get freely through the trees. Many questions were asked and a lot of useful information obtained.

Middle Dural.

On 18th October a meeting was held, when the principal business dealt with was the score card for judging fruit at shows, which had been submitted by the Fruitgrowers' Association. Steps are to be taken to have a weathershed provided at Middle Dural public school.

Miller's Forest.

At the last meeting of this branch the following paper was read by Mr. A. J. O'Brien:—

ONION GROWING.

This is a very profitable crop, and one that often receives little attention in the Hunter Valley. For the one farmer who goes in for onions in the district there are ten or more who only grow sufficient for their own home use;

and others grow none at all. They consider that it is too tedious, and that often the price per ton does not pay for the time required. These calculations are all erroneous, because no crop pays better, provided a farmer gets a fair season and a reasonable price. No matter how cheap the crop may be, the farmer can almost always rely on getting a prolific crop. Onions are extensively grown in Wellington and in different parts of Victoria; and there are farmers in those localities who grow no other crop. In the Hunter River district 5 acres is a large area.

There are various kinds of onions, some being much easier to keep from decomposition than others. The Hunter River onion is very fast-growing, but once it is pulled it will not last.

There are two ways of planting onions—one by the means of a machine made for that purpose, and the other transplanting with the hands. The former method is far the better, provided the ground is suitable for the machine. It is not always a success in black soil when the ground is rough, but on the river banks, where the soil is rich and very fine, the machine is very successful. In the Wellington district and in Victoria it is by the machine that the onions are planted, and later on they are cleaned with the same machine by adding additional gear.

Transplanting onions is very tedious if a large quantity has to be dealt with, but in my opinion better onions can be thus produced than by planting with a machine.

Onion seed should be planted early in April or at the end of March. The ground should be laid up for several months, and worked often, and allowed to sweeten. The soil should be well worked up, and the lands not be too wide, as it is better for drainage purposes. Sowing should be in rows, outlined with a marker, which consists of a piece of 4 x 4 timber, about 1 yard long, and fitted with a handle of light variety, about 5 feet long, set in the centre. In this "marker" four pegs should be set, about 1 foot in length. When the ground is fine and in order, open the drills with this marker, and have the onion seed in a saucer. Gather enough between the thumb and the two first fingers of the right hand, and spread thinly in the drills; afterwards cover lightly with a small hand rake.

If favourable showery weather is experienced, the seed will germinate very quickly, and once the seedlings appear above ground every care should be taken to prevent the growth of weeds. The plants should be ready for transplanting at the end of June or the middle of July. If the seed is grown by the planter it will be dropped at intervals of about 2 inches between each seed.

When the time arrives for transplanting, drills are made in the beds, the same as in the case of planting the seed. The plants are then dug or pulled up, the roots trimmed, and the heads cut. This is done so as to give the bulb a chance of coming at once in contact with the soil. In order to plant with comfort it is necessary to travel on the planting bed on the knees, and to carry the bundle of onions in the left hand, and in the right hand carry a peg in order to make a hole in which to place the onion. When the onion is deposited, press the soil tightly round the root of the plant, and then pass along to the next hole, which should be a distance of about 3 inches away. Three out of the four rows made with the marker can be planted at once, and the remaining one left as a guide for the next set of drills. A good planter can plant about 5,000 onions per day. After about a couple of weeks, the onions take root, and then the growth is rapid. The beds require continual chipping and weeding.

At different periods in the growth of the onion great care must be taken to prevent the plants from going to seed. Immediately plants have any inclination to seed, the heads must be broken off and destroyed, or all the strength of the plant will go to the seed, and not to the bulb.

Onions should be matured and ready for bagging at the end of December or early in January.

When picking time comes, the onions are pulled and thrown in a heap; the flag and the roots are then cut from them, and they are allowed to dry for a few hours before being bagged.

Moss Vale.

The annual meeting of this branch was held on 15th November, when thirty-five members were present. A very satisfactory balance-sheet was shown, and the work of the first year was felt to be more than satisfactory. The officers of the past year were again elected:—Chairman, Mr. L. T. Badgery; Vice-Chairmen, Messrs. H. Monk and J. Wallis; Treasurer, Mr. H. Richardson; Hon. Secretary, Mr. W. G. Bale.

An endeavour is to be made to build up a bureau competition at the district show. A start was made last year, with a prize of £10 10s., and this year it is to be £25, in addition to the competition shield presented by Mr. Orwell Phillips, which in itself is well worth competing for.

Quaker's Hill.

A meeting was held on 23rd November, when a proposal to hold a show in the district was discussed with interest.

The primary object is to demonstrate to the residents of the district what can be grown locally, and the nature of the assistance the Department and the Bureau can give. It was agreed that no monetary prizes be given, but only certificates; and that the profits of the venture, if any, should be handed over to the local branch of the Red Cross, as well as any donations, exhibits of fruit, vegetables, &c., available for the purpose. A committee has been appointed to carry out the project.

Spencer.

At the October meeting of this branch a paper was read by Mr. H. J. Woodbury, from which the following is taken:—

CITRUS FRUIT VARIETIES.

Our fruit trees may be divided into two groups—deciduous and citrus. The former lose their leaves in the autumn and lie dormant through the winter; the latter are evergreens, and have no dormant season. Both groups consist of numerous varieties. I will content myself here with dealing with the citrus tribe. Oranges, mandarins, and lemons come under the heading, although citrons, limes, and pomelos, or grape-fruit, are also citrus.

The first orange to come in is White Siletta. It is a good cropper and bears early, but the trees seldom attain much size. It often meets a good early market, and is principally grown on that account. The next is Paterson River; it is a very strong grower, and in good soil grows a tremendous size; it is longer coming into bearing, but its fruit is usually of very fine quality. Parramatta, another mid-season variety, is very similar to Paterson River. The old Siletta is a very fine orange; the tree grows a medium size, is an early and regular cropper, and bears a good quality, medium-size fruit. Joppa is a strong grower, a good and early cropper, and hangs well; fruit slightly oblong. St. Michael is a vigorous grower, and a heavy bearer, but the fruit is inclined to be a bit small. Jaffa, Mediterranean Sweet, and Ruby Blood are other mid-season varieties, but they are not at all popular with growers. Of the late varieties, the Valencia Late stands alone; it is a vigorous grower and an early and good cropper; fruit is of good quality, and will hang till after Christmas.

Of the navel varieties, the Washington seems to be the favourite. It is a very large orange, of good quality, a fairly vigorous tree, and a fair bearer. Other varieties are Thompson's Improved, Golden Nugget, Groverley, and Buckeye Navel. Navelencia is a new production, but I do not think it has come up to expectations.

If I was asked which are the best varieties of oranges to plant, I would say, for a big orchard, White Siletta as an early orange, the old Siletta for mid-season, and Valencia Late for a late orange. By planting these three varieties, the grower would be better assured of having a crop, and he would have a harvesting season extending from about the end of March into the New Year, thus giving a maximum of time for handling, and a first-class orange to meet every market. Of the navels, I would certainly say, plant a good strain of Washington Navel.

Among mandarins, the general favourite with growers is Emperor. It is extensively grown for market, and is too well known to need description. Beauty of Glen Retreat is a variety that seems to be coming into favour; it is a regular and heavy cropper, very deep colour, flavour rather tart. Early Imperial is similar to Thorny, but the fruit is larger, sweet, and thin skinned, and earlier to ripen. It is held by some to be the best early mandarin. Thorny is of medium size, flat, and thin skinned, unsurpassed for flavour, a good cropper, and early. Scarlet is very large, of deep reddish colour, and peculiar flavour. Parker's Special is similar to Beauty of Glen Retreat, and a very vigorous grower. Excelsior, Jacob's Special, King Emperor, and Oonshii are other varieties of mandarins, but so far they have not come much on to the market.

The common lemon is rough skinned and very hardy; it is extensively used for citrus stocks. Lisbon, which is largely cultivated, is a vigorous grower and heavy cropper; the tree is very thorny. Sweet Rind is a vigorous grower, a good cropper, nearly always bearing a good summer crop, few thorns. Villa Franca is of good quality; the tree is thornless, not as strong a grower as Lisbon, but a better summer cropper. Eureka has few thorns; the fruit is thin skinned, firm, and of splendid quality; profitable for its summer crop, but not such a vigorous grower as Lisbon. Messina and Genoa are varieties that are largely grown in Italy for export.

Of lemon varieties, I would recommend Sweet Rind. It is the most vigorous grower of the summer croppers, and not nearly so thorny as Lisbon—a fact to be considered in an orchard open to much wind—and it is an early and regular cropper.

DEPARTMENTAL NOTE.—The Fruit Expert remarks, in connection with the above, that Joppa orange does not hang well. With all citrus trees, especially with Washington Navel, it is essential that the trees shall be worked from wood from trees of the best strain.

St. John's Park.

At the meeting of the members of this branch, held on 15th November, Mr. W. A. Bate lectured on the Muscovy duck. He stated that he considered the Muscovy the best bird to keep for table purposes; it would thrive anywhere. Plenty of moisture was required for incubating eggs. If brooders were used, they should be kept away from other birds. Ducklings immediately when dry should be taken away from mothers and kept in brooders. Abattoir meat-meal was very good mixed with wheat-meal or pollard; the cost could be kept down by using 50 per cent. green food after the third week. Wheat-meal or pollard should be boiled, as it went further and was more nourishing. A dry spot to rest should always be provided. Drinking vessels should contain water deep enough for birds to cover their heads; this was essential. Fertility of duck eggs was more reliable than that of hen eggs; better percentages were obtained in hatching. Mr. Bate considered twenty plenty to run together; too much liberty was a mistake. After a journey the birds should be fed before giving them water.

Thyra-Bunaloo.

At a meeting on 20th October, 1918, an interesting paper was read by Mr. E. J. Beer, of which a summary follows:—

FORESTRY AND RE-AFFORESTATION.

If you want to see the effects of tree-planting I can recommend you to see the once treeless plains of Western Victoria. In a run through Skipton, Linton, Scarsdale, and Smythesdale, you may see miles of plantations in various stages of growth, from tender plants to grown commercial and shade timbers, and the owners value their plantations very highly. They seem to adopt the system of close planting, to make shade, shelter, and fire-break, and to induce a straight stem. The trees can be thinned out for rails, firewood, buildings, &c., and the remaining trees will expand for saw-mill purposes. It was cold weather when I visited this part, the wind being exceptionally chilly, but when the timber breaks were entered it was comparatively warm. These sheltered areas will fatten more stock, and do so in a much quicker time than unsheltered ones. As a business proposition, as well as from a humanitarian point of view, it pays to plant suitable trees on open areas. As the price of timber advances, these trees will become a very valuable possession. The war has been responsible for the use of vast quantities of valuable timber, and new forests will have to be created. I have a "forestry scheme" of my own. It is in regard to the low-lying lands of the Murray. Our legislators have yielded to the popular cry for land, and have permitted Crown lands to be taken up for grazing and agricultural purposes that are only fit to grow timber. The axe and the firestick have been ruthlessly thrust in, and the settler has carved out for himself a home in the forest. When the first flood comes along the settler is forced to leave his farm, and paddle out with his family, cows, pigs, &c., to the nearest sandhill. His crops, grass embankments, &c., disappear, and the settler laments his bad luck. His farm will afterwards produce millions of gum suckers and Bathurst burrs. Now, this land might produce for the State untold wealth in natural timbers. The Murray River is destined to be a great national water-way for the carriage of goods in all seasons of the year, and for vast irrigation schemes. These lowlands will then be more subject to floods in very wet seasons. I say the Government should resume these areas and put them to proper and profitable uses in producing natural timbers.

There is still another aspect of forestry. Sanctuaries should be made for wild birds of all descriptions. In America in the early days they were as prodigal as we with their natural forests, and they found that they not only wasted their timber, but they also destroyed their bird life. There were parts that were almost abandoned on account of insect pests having increased because of the destruction of birds—their natural enemies. And now the farmers have awakened to the facts, and are spending enormous sums annually in creating sanctuaries for their birds. In one place the orchardists actually built nests in the gardens for the starlings that previously they destroyed. I am informed that in Gippsland they protect the starlings and other birds, or they would have no fruit. Where would we be, too, if it were not for the ibis, quail, starling, larks, and all the insect-eating members of the feathered tribe? Providence, in wisdom, has wonderfully balanced nature; but man, in his endeavour to get rich quickly, has upset the equilibrium in some respects, and now it is high time that we commenced to remedy some of the evils we have committed. We should all assist in reclaiming the forests we have so ruthlessly destroyed.

Valla.

The annual meeting was held on 4th November, when the following gentlemen were elected as officers for the ensuing twelve months:—Chairman, Mr. J. R. G. England; Vice-Chairmen, Messrs. J. Tutt and W. J. Steele; Hon. Secretary and Treasurer, Mr. A. E. Reynolds.

Growing Vegetables for Home Use.

A discussion took place on the growing of vegetables for home use.

Mr. Reynolds said that, in choosing a site for a kitchen garden, a farmer should pick out a rich plot of land, well drained; a plot 2 chains by 1 would supply enough vegetables for an average family. In preparing the land, plough 6 or 7 inches deep. After ploughing apply well-slacked lime at the rate of 5 cwt. to the acre, as the soil in this district is deficient in lime. Let the land lie fallow for six or eight weeks, then at the first favourable opportunity cross-plough, work well with harrows, and bring the land to a good tilth; the finer the soil is worked the better the crop. In sowing the seed, see that the rows are as straight as possible; it facilitates the working of the land later on. Do not sow too thickly, and not too deep; about 1 to 2 inches is sufficient for most vegetable seeds. Such seed as cabbage, cauliflower, celery, tomato, and lettuce can be sown in a bed, and when big enough to handle, transplanted to their permanent positions in the garden. When the plants are big enough to distinguish the rows, start to cultivate. The hand wheel-hoe was recommended for a small garden, as a lot more could be grown on a small area when worked with a wheel-hoe than with horse cultivation. The soil can also be worked closer to the plants without injury to the crop. Such vegetables as carrots, parsnips, beetroots, beans, and lettuces, which are comparatively small-growing plants, soon feel the effects of weeds and grass. Consequently, the better and closer the cultivation the more weeds slain, and if the land has been worked fine at the start, it is a simple matter to run along the rows with a wheel-hoe. Plenty of cultivation is necessary for successful vegetable-growing. In dry weather cultivate once or twice a week, and form a mulch to prevent evaporation of moisture from the soil. After a storm it is advisable to go through with the cultivator next day and break up the crust which forms on the soil. The use of fertilisers is recommended. Most of the merchants put up mixtures to suit different crops, although it is best for a gardener to mix his own, always remembering that different vegetables require different proportions of the fertilising element; for instance, cabbages, cauliflowers, celery, lettuces, rhubarb, and other vegetables grown for their tops require plenty of nitrogen, but peas and beans and all root crops require more potash. It is not wise to apply a manure rich in nitrogen to a root crop, or the plants will develop big tops and a very small percentage of tubers. Gardens should always be cultivated on the flat. Do not hill up. It is a bad practice, as it exposes more surface to the sun and wind, and the soil will dry out much faster.

Mr. Coleman said he could recommend the hand wheel-hoe for a kitchen garden. It was a handy implement, and a lot of work could be done with it in a short time. It was possible to work with a wheel-hoe with the rows only 6 inches apart. He used fertilisers, and with judicious treatment the plants would fairly jump along. A small quantity of sulphate of ammonia would cause a bed of cabbage to heart up three weeks sooner than in the ordinary way.

Wellington.

At a meeting on 19th November, Mr. R. G. Harvey read a paper, of which the following is a condensation:—

Bees and Bee-keeping.

The little native bee of Australia builds its comb and stores its honey in almost the same manner as the imported bee, everything in connection with it being on a much smaller scale; it has no sting, and is considered valueless from a commercial standpoint by modern apiarists. The English bee, which was first imported into Australia, is very dark in colour, being almost black, and is far from being a clean housekeeper, and for that reason, perhaps, allows moth and other vermin to invade its hive, very often to such an extent that the vermin eventually take possession. Although this bee was originally considered a profitable honey gatherer, it has now been almost discarded for the Cyprian and Italian races, both of which are much superior in every respect. The importation and the general desire of bee-keepers to stock either Cyprian or Italian has resulted in almost all bees at present belonging to one or other of these races, or being hybrids.

The worker Cyprian bee has three distinctive yellow bands, the queen being a beautiful yellow colour, slightly varying to leather colour with age; a large percentage of the drones show the yellow bands. These bees, although proved to be valuable honey gatherers, have not become general favourites on account of their defensive character, for when a hive becomes properly excited it is advisable for an amateur to keep his temper and handle very carefully.

Undoubtedly, the most popular bees among modern apiarists are the Italian, of which there are two varieties, one being known as Golden Italian, which, in my opinion, is the show specimen. They are of a golden colour, as the name indicates, the queen being quite golden; the workers all show the three golden bands distinctly; the drones, although not as golden as the Cyprian, generally show the golden marking. The colour of the drones, however, is no proof that the progeny of the queen is not pure bred, the drones produced by some queens being much darker than others, although all may be classed as Golden Italians. This race of bees is easily handled, prolific, and first-class honey-gatherers. The other variety of Italian bee is known as the leather-coloured Italian. These are, as the name indicates, darker in colour than the Golden Italian, the queen being quite of a leather colour; the workers are also of a darker colour, but show the three yellow bands, whilst the drones are also darker, and a large percentage will be found quite as dark as the drones of the English bee. This race appears slightly larger than the Golden Italian, especially when young; they are also considered a hardier race, and are the bees I would recommend to an amateur apiarist to begin with, as by adopting this type he would benefit by the experience of apiarists who have devoted much time to the subject.

Presuming the amateur apiarist has his black or hybrid bees in a standard bar framed hive, which he must at the present time, to comply with the law in this State, his next venture will undoubtedly be to Italianise. This can be done by removing the queen and introducing an Italian queen in her place. Italian queens are sold by breeders, as untested, tested, select tested, imported, select imported, &c. As a beginner may not be successful in introducing a new queen into a hive, I would recommend him to purchase an untested queen. When your untested queen has arrived, open up the hive you intend operating upon, first of all giving the bees a good puff of smoke, close down the cover for a moment to allow the bees to inhale the smoke, then remove the super carefully, next the outside frame; this provides working space; then press a screwdriver between the frames, about the middle of the hive, remove a frame from near the centre, and observe the general condition of the hive. If queen cells are showing cut them out immediately from all the frames. This operation needs to be repeated every eight days to prevent swarming. The condition of the brood will convince you where your old queen has been working. Handle quietly, and you will soon discover her, and when you have done so, remove the frame clear away from the hive. Catch the queen and destroy her, then close your hive up, and within twenty-four hours you will notice the behaviour of the bees round the entrance, making distinctive signs that they have lost something; this is your opportunity to introduce the new queen. Now work carefully. If you introduce the queen direct the bees will probably consider her an intruder, and very soon you will discover her removed from the entrance dead or nearly so. To prevent this, the queen must be properly introduced. Procure two pieces of wood, each about 2 inches long, bore a hole clean through each, then fill the hole you have bored in one with candy, equal parts of honey and sugar worked to a stiff paste, tack a piece of thin cardboard over the end, then connect the two pieces of wood by covering them with a piece of fine wire gauze; the other piece of wood you require to release the queen and her attendants; when you have done so cork the end up securely. Your new queen and her attendants are now secure and ready to introduce into the hive, which is, as I have already stated, now ready to receive her. Open up the hive, as already explained, place your new queen, cage and all, between the frames. The bees will soon recognise the new queen, and immediately commence removing the cardboard, and when they have accomplished this they will tunnel through the candy, the queen and her attendants tunnelling from the inside. This operation will probably occupy at least twenty-four hours, and by that time the queen will have acquired the scent of the cluster, and when the bees release her they will welcome her with pleasure. After surveying her new home for a short time she will commence laying eggs, and your bees, that have shown broody signs near the entrance board for some days, will assume their usual busy appearance. In a few days' time, if you open the hive, you will discover her busy at work laying eggs, and you will get properly interested in your new blood in a few weeks' time, when you discover the little chaps out for the first afternoon play spell.

Now that your Italian queen has been properly introduced, she will continue laying eggs and producing Italian bees for two or three years, unless she escapes later with a swarm, but this can be prevented by clipping her wing. Just catch her carefully by the thorax, under and over, never by the wing or abdomen; with a sharp pair of scissors nip off about one-third of one of her wings. If she then emerges with a swarm, and you happen to be handy, you will discover her hopping about near the entrance of the hive. While this is taking place, and your swarm is in the air, remove the old hive, bees and all, to a new location; replace it with a new hive. Presently the bees will commence to return to the old place, where the empty hive is now situated. Now remove one frame of brood from the old hive, place it in the new one, and release your clipped queen at the entrance, and your second Italian hive is established. Should you desire to increase your hives, and the season is favourable, this is your opportunity. Divide the frames in the old hive and place one or two of them with one or more capped queen cells attached into a new hive, close the entrance securely with moss or grass, so that no bees can escape for at least three days; by that time sufficient young bees will be hatched to take care of the new home. This method may result in some failures by beginners, but it is a simple and inexpensive way to Italianise, especially if you are working with valuable stock.

Another method easily applied is to remove as many queens as you can procure capped queen cells from your breeding queen to replace; place the capped queen cells in a queen cell protector, which is a piece of fine wire gauze made into a small bag, sufficiently large to contain the queen cell; punch a hole in the lower end of the protector with a steel or other perfectly round instrument. This hole must be the correct size to allow the queen cell to protrude to the exact position encircling the cap on the cell. The bees never attack a queen cell at the end, hence the reason for leaving this exposed and protecting the sides. Your young queens will soon hatch, and naturally they have already acquired the correct scent by hatching in the hive. This method is quite simple, and you can soon Italianise your apiary. With a little care twenty hives could easily be Italianised from one queen in a year. The best method to adopt to handle a swarm of bees that has clustered is to carefully catch the queen, place her in a cage—a matchbox will do; provide some ventilation, of course—and you have practical control of the swarm. If your new hive is not quite ready when your queen is caged, your swarm is safe.

Approximately, 4 lb. of bees constitutes an average swarm, 4,000 bees to the pound; so a swarm consists of about 16,000 bees, and measures about 4 quarts. Worker bees are undeveloped females, the development taking place at the wish of the bees in the hive. If the young are allowed the ordinary food after being hatched from the egg, and then sealed, they become fully-grown workers twenty-two days from the day the egg is laid. If required for queen, the female egg is fed on a special food, known as royal jelly, which resembles condensed milk in appearance, and is quite bitter. This special food causes the bee to develop rapidly, and a full-grown queen is raised fifteen days from the day the egg was laid. The drones are produced from drone or male eggs, and fully develop twenty-six days from the day the egg is laid. The older the queen the greater the probability that she will lay male eggs, provided, of course, drone cells are available for her to deposit the eggs in. The production of drones may be curtailed to a certain extent by providing all worker comb, also by regularly cutting out the drone comb, and keeping your queens young and vigorous. The queen emerges from the hive on her wedding flight about the fifth day of her life, early in the afternoon—if the weather is favourable—and meets the drone high in the air, where she becomes fertilised for life. From this it will be noted that there is no need to rear a large number of drones, and it is advisable to allow your choicest queens to supply the whole of the drones required, if possible. Of course, the queen may meet a black or hybrid drone, and her progeny would not be pure, and this is a matter that cannot be regulated.

Bee-keeping is an occupation that requires both study and patience, much of the success or otherwise depending upon the individual and the locality. A few hives may prove profitable in any locality, but often when the number is increased to the size of an ordinary apiary, failure results. No farmer or orchardist should be without a few hives, as they are a valuable adjunct to the home, and the fresh honey that one has extracted himself always appears of better flavour from the fact that you know it is pure. I mentioned location for an apiary, and to my mind an ideal spot would be a moderately warm climate, an easterly aspect, with a forest of yellow box, hills as a background, with lucerne paddocks or orchards for the foreground. I do not consider bee-keeping a suitable occupation for women, as it requires some strength to handle ten-frame hives when full of honey.

Of hives, I prefer the standard ten-frame hive for the brood nest, using two shallow extracting supers, divided from the brood nest by the new slotted wire queen-excluder. The ten-frame supers work well with nine frames in the super, spaced a trifle further apart; this ensures wider combs, and they are easier uncapped, and contain more honey with less capping for the bees to perform. The bees know when the honey has sufficiently ripened and then cap it over; for that reason uncapped honey is generally thinner than capped honey, and has not the same keeping qualities, being much more liable to candy.

The honey varies so much in different localities that it is difficult to write much upon the subject. In some districts a first-class honey is gathered from dandelion. Generally speaking, the honey gathered from yellow box, which is not liable to candy, on account of its density, may be classed as one of the best in this State. Good honey is often obtained in cold climates from clover; it is a beautifully flavoured, light-coloured honey, but very liable to candy. Lucerne also provides a very nice light-coloured honey. Honey as a food is invaluable, and no home should be without it.

When handling bees always provide yourself with a good smoker, but do not use any more smoke than is necessary. Give them a good puff or two when you first raise the cover of the hive, then close down for a few minutes. This allows them to take in a gorge of honey, and they are not so likely to sting. The most advantageous time to handle bees will be found about noon on a warm day; the old fellows will be away from home, and the young ones are not so difficult to handle. If you get a few stings, do not flinch or move, or more are sure to follow; make them think the stings do not hurt, and after you have kept bees for a while you will find that stings do not worry you much, except, of course, about the eye; for that reason it is advisable to wear a light veil, especially when you first commence keeping bees.

In reply to questions, Mr. Harvey said that a fair return from thirty hives would be between £30 or £40 per annum, but this did not apply to Wellington district, which was a very poor district for good-quality honey. The honey was kept in the cells by suction, and if a pin were pushed in at the back of the cell the honey would flow out. If a queen did not take her flight she would lay drone eggs. The average life of a queen was three years, and a worker six weeks, and a queen laid 3,000 eggs daily. The Americans had given up the idea of wiring the frames. Yellow box was the best for honey. He thought bees secured pollen from wattle blossoms. Italian queens could be imported from Italy at 8s. 4d. each, and from America at 10s.

Mr. W. le G. Brereton, Assistant Fruit Expert, visited Wellington on 4th December, and gave a demonstration of summer pruning methods. The object, he said, was to stop or cut out all superfluous growths, in order to benefit the remainder; but in this district very little topping was needed this year owing to the trees not having made much growth. In orchards exposed to a good deal of wind, topping was done to prevent the trees being damaged, and it was also advisable where artificial watering is practised. With summer pruning two seasons' growth could be obtained in young trees. This kind of pruning was also carried on in some varieties of apples and pears by shortening back some of the laterals to force out spurs lower down the lateral, but, as a rule, this should not be done till the growing season was over, say the end of January. The same applied to peach and nectarine trees, to help force out the fruit buds lower down the laterals. One of the main objects of thinning out was to let the light and air in, so that the fruit-bearing laterals and spurs in the centre of the tree might develop properly.

In the evening Mr. Brereton gave an address on the pests and diseases of fruit trees, vines, and vegetable crops.

Woonona.

A meeting was held on 18th November. It was decided to assist a returned soldier to start a poultry-farm at Woonona. Mr. Robson promised to give the returned soldier a breeding pen, consisting of six hens and a rooster.

A very interesting paper on the use of grit for poultry was read by Mr. Fowler.

Ten new members joined the branch.

Yurrunga and Avoca.

The annual meeting of members was held at Avoca on 16th November. There was a fair attendance. The Secretary's report showed that thirteen new members had joined during the year, while several had left the district. Altogether the present membership was forty. The Treasurer's report was also satisfactory. Mr. J. H. Gilbert was elected as Vice-Chairman. All the other office-bearers were re-elected.

THE SELF-FEEDER IN PORK PRODUCTION.

THE use of the self-feeder in pork production has become a marked feature of United States methods, and has been greatly extended in recent years. Experimental data and experience indicate that self-feeders have a use in one form or another on all farms from which any considerable number of pigs are marketed. To secure the best results, intelligent choice of feeds to be fed from them, as well as the exercise of good judgment in selecting the time and place of use, is essential.

There are several types, but most of these will give a continuous supply of shelled corn, but apparently there are only a few types which will operate successfully with pollard, ground grain, &c.

A recent circular of the University of Illinois Agricultural Experiment Station, summarises the following ten Don'ts for the use of the self-feeder.

1. Don't feed corn in the feeder without some good supplement. Pigs need additional protein and minerals.
2. Don't forget the water and minerals—self-feed them both.
3. Don't start the pigs on the feeder without working them up to a full feed gradually.
4. Don't let the feed sour in the bottom of the hopper.
5. Don't use the feeder unless you want the pigs to get ready for market, at the rate of about 1¼ lb. gain per day.
6. Don't feed breeding animals from the self-feeder unless they are very thin or unless a sufficiently bulky feed is used.
7. Don't expect to self-feed pigs to as great a weight as you can carry them when hand-feeding; they finish at a lighter weight.
8. Don't confine the self-fed pigs to such a small area that they do not get the proper amount of exercise.
9. Don't set the feeder in a mud-hole. Put it on a platform at least and under a roof if possible.
10. Don't trust the feeder to do it all. You must fill it when empty, and inspect it daily to see that it is working properly.

Orchard Notes.

JANUARY.

W. J. ALLEN.

Cultivation.

OWING to the continued dry weather this is the most important work of the season, because the vitality of the trees must be kept up in order to maintain the best possible growth and bud development. If moisture fails, not only will the present crop suffer but next season's crop will also be diminished. The cultivator must be kept going constantly, stirring the soil deeply.

Irrigation.

Wherever it is possible to do so, water should be applied to all trees and vines should the weather continue to keep dry. The land must be thoroughly stirred with the cultivator after each watering.

It is advisable to water all newly-planted trees if they show any sign of distress from lack of soil moisture where irrigation is not possible. A basin should be made round the young tree, about 1 foot from the main stem; this basin should be filled with water, and when it has soaked away the basin should be filled in and the soil round the tree lightly hoed to enable the moisture to be retained. It may be necessary to repeat the watering.

Harvesting.

The marketing of summer fruit calls for regular attention. All fruit should be picked when in a firm, sound condition, and carefully graded and packed so that the fruit throughout the case is of the same standard and quality.

Summer Thinning.

Any trees that are at all dense should be judiciously thinned of any excess or useless growths, more especially in the centre of the tree; this permits a free circulation of light and air and the ripening and maturing of the fruiting wood and spurs. This treatment also enables a better colour being obtained in the fruit, and owing to the removal of waste growths this sap is available for increasing the size of the fruit.

Citrus Scale.

This is the best period of the year for coping with scale insects. The young scale are hatching out, and a more complete eradication of the pest may be obtained by either spraying or fumigation.

Fruit Fly.

The dry season affords very suitable conditions for the breeding up of this pest, and every care should be taken to collect all windfalls and destroy, by boiling, all infested fruit.

Codlin Moth.

It is advisable to give a spraying this month for this pest, and in late districts a spraying should be given in February. Pick off and destroy all fruit already infested.

Young Trees.

All young trees should receive constant attention. It is essential in a dry year, such as the present one, that the ground round them be kept constantly but lightly stirred with the hoe so as to hold the soil moisture. All useless or crowded growth should be removed or shortened, thus throwing the full energy of the young tree into building up sturdy limbs.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1919.

Society.	Secretary.	Date.
Miranda A. and I. Exhibition	L. J. Ennis	Jan. 10, 11
Albion Park A., H., and I. Association	H. G. Fraser	,, 15, 16
Gosford and Brisbane Water A. and H. Association	W. Moore	,, 24, 25
Kiama Agricultural Society	G. A. Somerville	,, 25, 27
Dapto A. and H. Society	F. James	,, 31; Feb. 1
Wentworth Falls A., H., and I. Society	C. P. O'Kelly	Feb. 5
Berry A. Association	W. Pryor	,, 5, 6
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 13, 14
Central Cumberland A. and H. Assocn. (Castle Hill)	H. A. Best	,, 14, 15
Manning River A. and H. Association	L. Plummer	,, 19, 20
Ulladulla A. and H. Association (Milton)	R. F. Cork	,, 19, 20
Coff's Harbour and District A. Society	C. Vost	,, 20, 21
Wollongong A., H., and I. Association	W. J. Cochrane	,, 20, 21, 22
Yanco Irrigation Area A. Society (Leeton)	T. H. Hogan	,, 25, 26
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 25, 26, 27
Inverell P. and A. Association	J. T. Dale	,, 25, 26, 27
Dorrigo and Guy Fawkes A. Association	R. R. Blair	,, 26, 27
Gunning P., A., and I. Society	J. R. Turner	,, 26, 27
Newcastle A., H., and I. Association	E. J. Dann	,, 26, 27, 28; March 1
Bathurst A., H., and P. Association	S. V. Turrell	Mar. 4, 5, 6
Tenterfield P., A., and M. Society	R. S. Smith	,, 4, 5, 6
Bega A., P., and H. Society	H. J. B. Grime	,, 5, 6

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1919.

Society.	Secretary	Date.
Bellinger River A. Association	J. F. Reynolds	Mar. 5, 6
Braidwood P., A., and H. Association	L. Chapman	,, 5, 6
Tumut A. and P. Association	T. E. Wilkinson	,, 5, 6
Berrima District A., H., and I. Society (Moss Vale)	J. W. Kenny	,, 6, 7, 8
Bangalow A. and I. Society	W. H. Reading	,, 11, 12
Cootamundra A., P., H., and I. Association	N. Gardner	,, 11, 12
P. and A. Assn. of Central New England (Glen Innes)	G. A. Priest	,, 11, 12, 13
Kangaroo Valley A. and H. Association	L. W. Vance	,, 12, 13
Nambucca A. and H. Association	M. Wallace	,, 12, 13
Tumbarumba and Upper Murray P. and A. Society	W. R. Figures	,, 12, 13
Orange A. and P. Association	W. J. I. Nancarrow	,, 12, 13, 14
Blacktown Branch of the Agricultural Bureau of New South Wales.	R. H. Lalor	,, 13, 14, 15
Goulburn A., P., and H. Society	H. C. Fraser	,, 13, 14, 15
Mudgee A., P., H., and I. Association	E. J. Hannan	,, 18, 19, 20
Armidale and New England P., A., and H. Assocn.	A. McArthur	,, 18, 19, 20, 21
Cobargo A., P., and H. Society	T. F. Kennelly	,, 19, 20
Crookwell A., P., and H. Society	P. R. Marks	,, 19, 20
Gundagai P. and A. Society	C. D. Asprey	,, 19, 20
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 19, 20, 21
Tamworth P. and A. Association	J. R. Wood	,, 25, 26, 27
Dubbo P., A., and H. Association	F. Weston	,, 26, 27
Cooma P. and A. Association	C. J. Walmsley	,, 26, 27
Walcha P. and A. Association	S. Hargrave	,, 26, 27
Hunter River A. and P. Association	E. H. Fountain	,, 26, 27, 28, 29
Taralga A., P., and H. Association	J. J. Kearney	,, 27, 28
Dungog A. and H. Association	W. H. Green	April 2, 3, 4
Quirindi District P., A., and H. Association	A. Pountney	,, 2, 3, 4
Camden A., H., and I. Society	A. E. Baldock	,, 3, 4, 5
Batlow A. Society	C. S. Gregory	,, 8, 9
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 9, 10
Royal Agricultural Society of N.S.W.	H. M. Somer	,, 15–23
Moree P. and A. Society	A. U. Ezzy	May 21, 22, 23
Parkes P., A., and H. Association	G. W. Seaborn	Aug. 20, 21
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 26 27, 28
Corowa P., A., and H. Society	J. D. Fraser	Sept. 2, 3
Ganmain A. and P. Association	T. S. Henderson	,, 9, 10
Albury and Border P., A., and H. Society	F. J. Belbridge	,, 9, 10, 11
Temora P., A., H., and I. Association	A. W. Ness	,, 16, 17, 18

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1919.

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3rd February, 1919.

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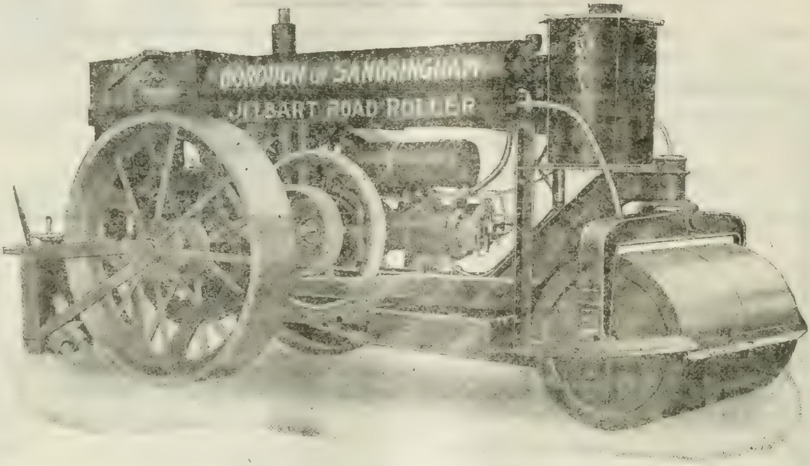

Ploughing by Tractor.

THE present dry season has forcibly demonstrated the advisability of installing a suitable farm tractor to do the work which horses can only perform at a prohibitive price owing to the abnormal cost of up-keep. In view of the necessity for early ploughing and seeding the claim of the

Jelbart Tractor

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Agricultural Gazette of New South Wales.

Take-all, the Wheat-growers' Worst Enemy.

J. T. PRIDHAM, Plant Breeder.

FOR some years the writer has noted the prevalence of this disease in the breeding plots at the Cowra Women's Training Farm and on most of the other Government farms where wheat is grown. This season a count was made of the number of plants seriously affected by the disease in the different varieties grown. These were rooted up and removed. There were plants, however, showing only one or two diseased ears, and these were not included with the others for fear of losing too much grain, so that the figures in the table appended may be taken as considerably below the actual facts and a conservative estimate of the loss due to the disease. Whereas rust is troublesome only in odd seasons in the wheat belt, Take-all must be reckoned with every year. It is true that in some seasons it is worse than others, but we have seen it more or less every year at the breeding station at Cowra. Nor is Cowra more liable to the disease than other districts; it has been noticed in the districts further west and in the Riverina. We do not wish to raise an unnecessary note of alarm, but it is fair that farmers should have their attention drawn to the true state of affairs, and perhaps someone will be given the task of investigating this widespread parasite of the wheat-fields.

Whether the disease is caused by the fungus *Ophiobolus herpotrichus*, by *Cladosporium herbarum*, by *Fusarium rubiginosum*, or by *Mucor racemosus*, or by a combination of more than one of these, the result is much the same on the plant.

The spores of *Ophiobolus* may not be present, but one is free to say from the symptoms in evidence that the condition to all intents and purposes is one of Take-all. Briefly, the effects are these:—The roots become rotten, so that the affected plant may be easily pulled up; the straw is not normal in tint and has a darkened brownish appearance immediately above the root; the ear, when formed, is thin, flat-sided, and faded in appearance, showing an absence of the fresh tints of the healthy ear. What has prevented farmers from realising the seriousness of the disease is the partial and slight attacks which escape notice. In an extreme case the plant forms no ears, merely showing a tuft of rotten leaves a few inches high. In another form the ears are formed, but are bleached and empty, giving rise to the name "white-heads." Partial infection, which is most common, results in one or more heads being affected, generally the later stools. These form light pinched grain, or no grain that the harvesting machine will retain. The loss due to these diseased ears, though the rest of the ears on the plant may be perfectly healthy, producing heavy grain, is hardly grasped except by an unusually observant person.

With regard to other diseases, flag smut was not so abundant as it would probably have been if the rainfall had been greater.

Cases of loose smut, bunt, and flag smut have been recorded in the table below. Rust was present, but in such slight degree that the yields were not affected appreciably. There were four plots sown of each variety, and the plots were about a chain apart respectively in order to cover the variations of soil.

On looking over the table it will be seen that no variety is immune, but that the early maturing, short-season wheats are, broadly speaking, most free from Take-all.

The variety Heywood's, received from a farmer of that name, was not so vigorous as last season; this was true also of Cowra No. 19, and their comparatively high percentages for early wheats may be partly due to this cause.

VARIETIES of Wheat.

Variety.	No. of Days Maturing.	No. of Plants affected with—				Total number of Plants which Grew.	Percentage of Take-all Infested Plants.
		Loose Smut.	Bunt.	Flag Smut.	Take-all.		
Plowman's No. 3	173	...	...	...	3	88	3·38
From Cruickshank's	175	...	...	...	3	87	3·44
Primrose	175	...	...	...	6	88	6·81
Hurst's No. 8	175	...	...	...	1	72	1·38
Pioneer	175	...	...	2	10	84	11·90
Bunyip	176	...	...	...	3	77	3·89
Wagga No. 22	176	...	...	...	7	82	8·53
Hurst's No. 3	176	...	...	...	1	81	1·23
Hurst's No. 11	176	...	...	..	3	85	3·52
Clarendon	176	...	...	..	5	88	5·68
Florence	176	...	...	...	9	85	10·58
Comeback	176	...	...	...	5	80	6·25
Heywood's	176	...	...	...	21	84	25·00
Cowra No. 19 (B)	177	...	...	...	14	83	16·86
Ecksteen	177	...	...	...	6	84	7·14
Nyngan No. 3	177	...	...	...	2	87	2·29
Thew	177	...	..	...	5	88	5·68
Cowra No. 24	177	...	...	...	3	74	4·05
Improved Steinwedel	178	...	...	...	4	71	5·63
Steinwedel	178	...	...	...	3	83	3·61
Gresley (No. 83)	178	...	...	...	13	86	15·11
Cowra No. 19 (A)	178	...	...	...	14	89	15·73
Van Neikerk	178	..	...	...	5	89	5·61
Hurst's No. 9	178	...	...	...	3	82	3·65
(Redskin x Yandilla x Federation)	179	...	...	2	3	83	3·61
(Standard Red x Yandilla)	180	...	...	...	3	95	3·15
Silver Baart	180	...	...	...	4	78	5·12
Canberra	180	...	..	...	3	81	3·70
Salter's Hard Federation	180	...	...	1	5	88	5·68
(A) (Hudson's Purple Straw x Gluyas)	180	...	...	...	1	87	1·14
(B) (Hudson's Purple Straw x Gluyas)	180	...	...	...	7	90	7·77
Hard Federation (1)	180	...	1	3	6	85	7·05

VARIETIES of Wheat—*continued.*

Variety.	No. of Days Maturing.	No. of Plants affected with—				Total number of Plants which Grew.	Percentage of Take-all Infested Plants.
		Loose Smut.	Bunt.	Flag Smut.	Take-all.		
Hard Federation (2)	180	...	...	...	8	80	10·00
King's White	180	...	...	1	1	87	1·14
King's Early	180	..	...	..	3	88	3·40
Golden Drop	181	1	...	...	4	87	4·59
Newman's Early	181	...	...	1	4	72	5·55
Caliph	181	...	..	...	8	88	9·09
Walmer	181	...	...	...	11	80	13·75
Triumph	181	..	...	...	6	85	7·05
(c) (Hudson's Purple Straw x Gluyas)	182	...	...	...	1	91	1·09
Yellow Cross	182	...	...	...	6	48	12·50
Basil	182	...	...	...	15	83	18·07
Plowman's No. 1	183	...	...	...	3	72	4·16
Plowman's No. 2	183	...	...	...	6	85	7·05
Federation	183	...	...	1	9	79	11·39
Coronation	183	...	...	...	6	86	6·97
Warren	183	...	..	...	9	89	10·11
Bomen	183	...	...	..	16	79	20·25
Bobs	184	...	...	4	10	83	12·04
Eclipse	184	...	...	...	5	81	6·17
Wilfred (No 51)	184	...	...	...	5	82	6·09
Joyce's Federation	184	...	...	1	23	70	32·85
Minister	184	...	...	...	20	87	22·98
Dreadnought Crossbred	185	...	...	1	9	80	11·25
Sanger's Prolific	185	...	...	1	17	88	19·31
Moira	185	...	...	...	23	87	26·43
Currawa	185	...	...	...	12	77	15·58
College Purple	185	...	...	..	20	96	20·83
Queen Fan	185	...	...	...	11	88	12·50
Warren (Chili)	185	...	...	...	3	86	3·48
Rymer	185	...	...	...	13	85	15·29
Field Marshall	186	...	...	...	13	85	15·29
Cowra No. 20	186	..	...	...	12	76	15·78
Warden	186	..	...	...	9	86	10·46
Baltinglas	186	..	...	...	9	85	10·58
Ortlipp's Bungowannah	186	1	16	..	13	83	15·66
Anvil	186	...	...	...	16	90	17·77
World's Wonder	186	...	31	...	11	87	12·64
Penny	186	...	...	1	14	34	16·66
Droophead	187	...	...	1	10	93	10·75
Droophead (Sailor's Fortune)	187	...	...	2	10	86	11·62
Boureong	187	...	...	..	8	82	9·75
Farrer's Drought-resistant	188	...	...	1	12	92	13·04
Yandilla King	188	...	...	...	20	83	24·09
Roseworthy	188	...	...	...	13	77	16·88
Marshall's No. 3	188	...	...	...	21	79	26·58
Major	188	...	...	...	27	80	33·75
Currabubula Bearded	188	...	...	...	11	76	14·47
Wagga No. 46	190	...	...	1	8	82	9·75
Standerton Winter	194	...	...	...	19	88	21·59

The plots were sown on 24th May, the soil being moist and in good condition. The subsequent rain until harvest time was as follows:—June, 139 points; July, 98; August, 429; September, 59; October, 94; November, 107—a total of 926 points during the growing season.

Popular Descriptions of Grasses.

[Continued from Vol. XXIX, page 847.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE NATIVE PANIC GRASSES.

As already pointed out, New South Wales is well endowed with Panic Grasses, particularly in those districts which are served with good summer rains, such as the North-west, West, and Coastal areas, where they provide no small proportion of nutritious succulent feed for sheep and cattle. There are several characteristics about the Panic grasses which render them superior to many others. Some of the most important of these are:—(1) They are nearly all succulent and nutritious in character; (2) they are very vigorous in growth; (3) they are excellent seeding grasses; and (4) many of them possess deep-rooting habits, and a bulbous root-stock, rendering them more or less drought-resistant. It is the presence of these features which has engaged the attention of the Department, with the hope that some may possibly be brought under cultivation, and prove of great value in the mixed farming districts where pastures for the carrying of sheep during the summer and autumn months is a matter of some moment. Some of the Panic grasses have in the past been improved to such an extent that we now possess many good millets which are largely cultivated. Amongst these may be mentioned Japanese millet from *Panicum colonum*; broom corn millet from *P. miliaceum*; and other Panic millets from *P. frumentaceum.*

Several native Panic grasses were tried at the different Experiment Farms in order to determine those which were the most promising under cultivation. Up to date the best results have been achieved with *P. prolutum* (Coolah grass), *P. flavidum* (Warrego Summer grass), and *P. decompositum* (native millet).

For the sake of convenience, therefore, the native Panic grasses will be divided into two classes for discussion, viz., those which have proved promising under cultivation, and those of great value in native pastures.

Native Panic Grasses promising for Cultivated Pastures.

Coolah Grass (*Panicum prolutum*). (Fig. 1.)

This grass is widely distributed over Australia. In New South Wales it reaches its best development in the Western Plains and Riverina. It will often be found to dominate a situation on low-lying areas where its tufts are large and cover the ground well. It need not be assumed from this, however, that it is a grass requiring plenty of moisture for its existence, as it has been found to be extremely drought-resistant, as hardy as any of the Panics in fact.

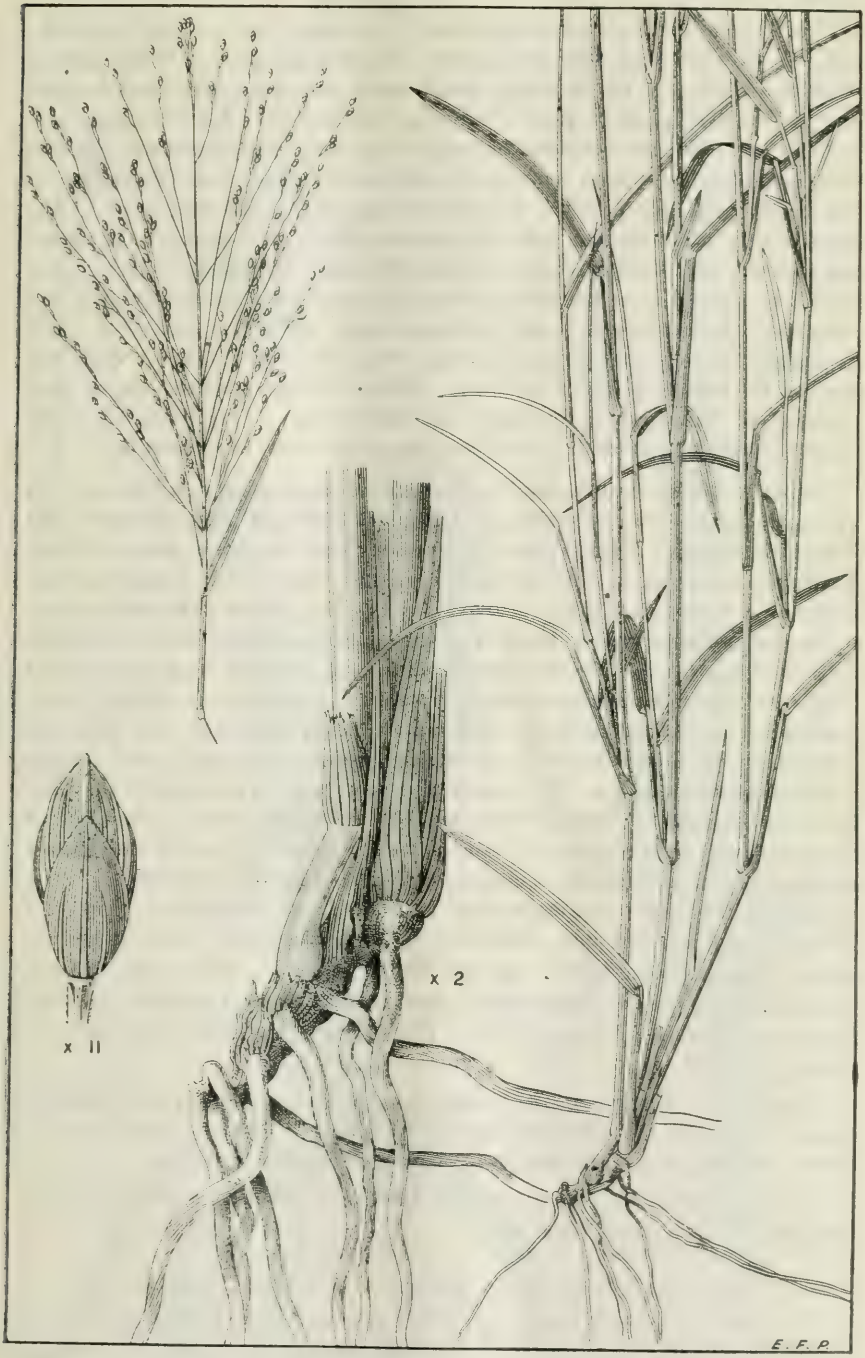


Fig. 1.—Coolah Grass (*Panicum prolutum*).
Note the wiry roots and the long character of the root-stock which allows offsets to be easily obtained.

POPULAR DESCRIPTIONS OF GRASSES.

Coolah grass has a characteristic habit. Its stems are on the wiry side, but its leaves are long, soft, and narrow. The brick-red colour of the anthers when the plant is in the flowering stage forms rather an attractive feature. It is a long-lived grass, as plots established at Bathurst for a considerable number of years have not deteriorated in any way. It comes into growth very soon after the winter months (as early as the beginning of August in the North-west) and provides feed up to May of the following year. The grass is very palatable and evidently stands plenty of stocking. It makes vigorous growth, often reaching a height of 5 feet, with stools 3 feet across. It will be noticed from the drawing that the root-system is particularly well developed, the main roots being thick and tough, while the root-stock itself is slightly bulbous in character, giving off roots at intervals, so that the base of the stem is slightly prostrate. This is a feature which renders root planting of this grass a very easy and safe process. The offsets are easily divided, and even under dry conditions the roots strike fairly readily.

Owing to the favourable results obtained by establishing small plots of this grass, the areas were extended at Bathurst, Cowra, Wagga, Nyngan, and Yanco Experiment Farms, and at the present time fair-sized plots at these Farms are in existence. From these plots the seed is harvested and distributed to various localities. The grass has not reached the stage when it can be recommended to farmers of the slopes and tablelands to sow in cultivated pastures. The difficulty in obtaining seed of high vitality and quickness of germination has been a drawback. As a rule the seed of native grasses is very spasmodic in its germination, being generally low and also dependent on thunderstorms and certain necessary climatic conditions to produce the best results. This means that the grass in cultivated lands is at the mercy of summer weeds, which are likely to choke it out. Pastures of this grass have been obtained by sowing the seed, but at present the chances are too risky to advocate it to farmers. Under cultivation and selection the vitality of the seed has considerably improved, and germination results of 50 and 60 per cent. are now obtained. It is quite possible that, by sowing with a strong-growing cover crop like Sudan grass, to choke weed growth, the seed will be enabled to germinate during the spring and summer, and thus become established by the autumn. Experiments on these lines are now being conducted.

A pasture of this grass, with others, has been in existence at Bathurst Experiment Farm for some considerable time, and it is there found that it stands stocking very well, and is very hardy under dry conditions.

Some good yields have been obtained from this grass by pupils of Public Schools, who have established plots.

WARREGO SUMMER GRASS (*Panicum flavidum*). (Fig. 2.)

This grass is confined mostly to North Australia, Queensland, and New South Wales, and is practically absent in the Southern States. It is also indigenous to India and other warm parts of Asia.

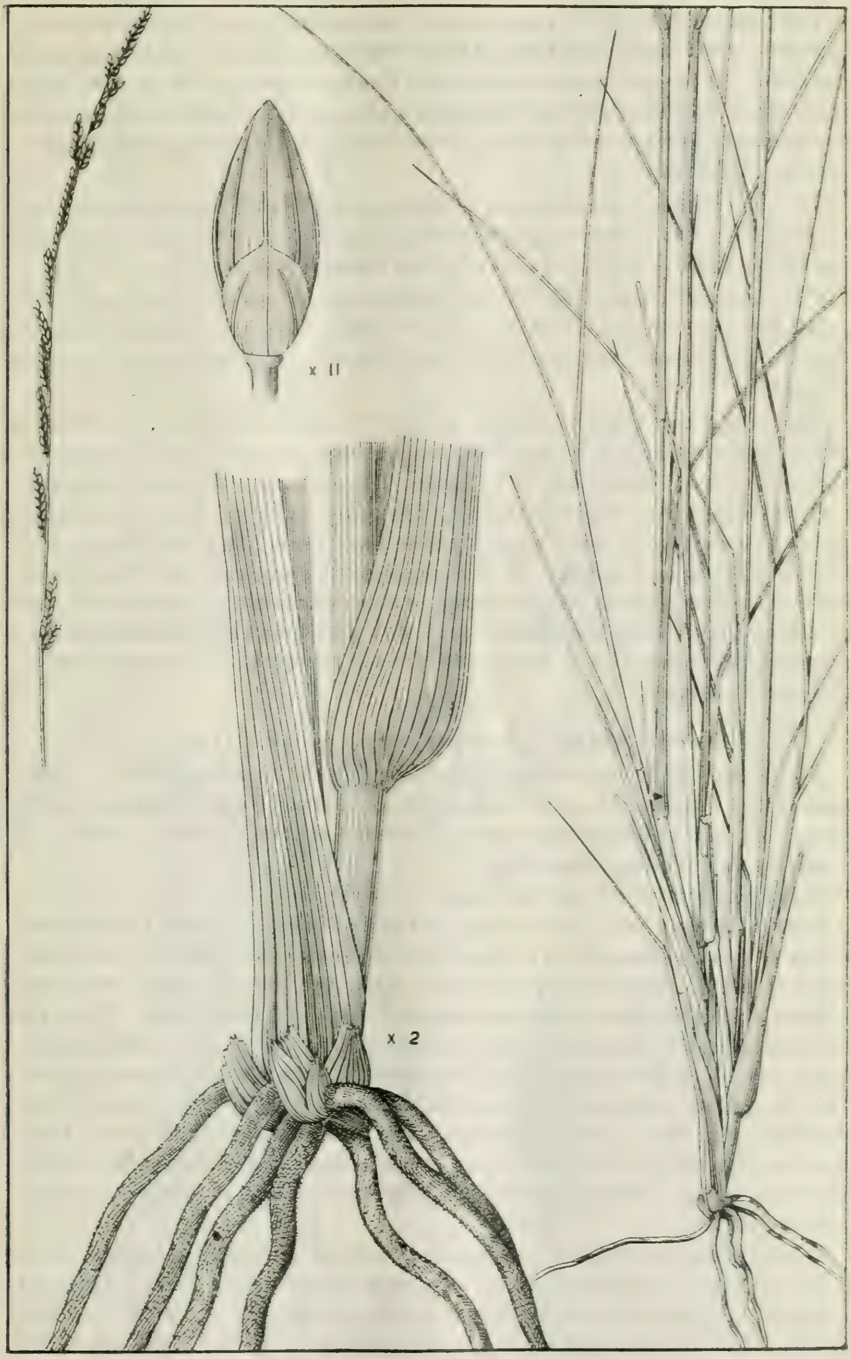


Fig. 2.—Warrego Summer Grass (*Panicum flavidum*).
Here again we have a vigorous root system—a drought-resisting characteristic.

Popular Descriptions of Grasses.

The grass may be easily recognised by the arrangement of the seed-bearing spikelets, which are in the form of short double rows placed at intervals along the stem. It is sometimes confused with *Panicum gracile*, but in the latter the rows of spikelets are very irregular, and, as a rule, smaller, and the seeds are also not so large, and do not present the slightly swollen appearance often seen in *P. flavidum*.

Warrego Summer grass is more succulent and probably more palatable than Coolah grass, but it does not grow nearly as vigorously as that grass, is always smaller in stature, and the yields of green fodder are always less.

Practically the same climatic conditions appear to suit this grass as Coolah grass, but it grows much better in the Western districts, such as Nyngan, than on the Central Tablelands such as Bathurst, or in the Riverina, such as Wagga.

The seed of this grass has higher germinating qualities than that of Coolah grass, results as high as 66 per cent. having been obtained as the result of cultivation and selection. The grass, however, sets its seed somewhat irregularly, and is difficult to harvest. It grows well under root planting, and the tussocks soon reach a considerable size. This grass was mixed with Coolah grass in a pasture at Bathurst Experiment Farm, and up to the present has endured the grazing and trampling of stock excellently. As in the case of Coolah grass, when the difficulties of slow and spasmodic germination are removed, there should be a distinct future for the grass for laying down in cultivated pastures.

NATIVE MILLET (*Panicum decompositum*). (Fig. 3.)

This is one of the largest Panic grasses growing in New South Wales. Like most of the Panics it is mostly confined to the warmer parts of the continent, being very rare or absent throughout Victoria and the southern portions of Southern and Western Australia.

This grass attains its best development on the red and black soils of the interior, where during a good spring and summer its broad leafy foliage forms a very attractive feature. The structure of the stem and leaf in good situations is very characteristic, the stems being particularly large, soft, and hollow, while the leaves sometimes attain a width of half an inch. From the appearance of the plant one would imagine it sensitive to dry conditions, yet this is not so, as its endurance in this respect is better than in most grasses This drought-resisting capacity is probably due to the protected nature and the thick character of the root-stock. The leaf sheaths at the base of the stem are generally very numerous, and must act as a deterrent to evaporation. The root system, although strong and vigorous, does not penetrate deeply into the soil.

Native millet can only be considered a valuable grass in good seasons. It is particularly characterised by its very rapid growth after rains. It grows vigorously or remains dormant almost contemporaneously with the wet and dry periods. Its best period of growth appears to be in December, when with monsoonal rains it will reach its full development in two or three weeks.

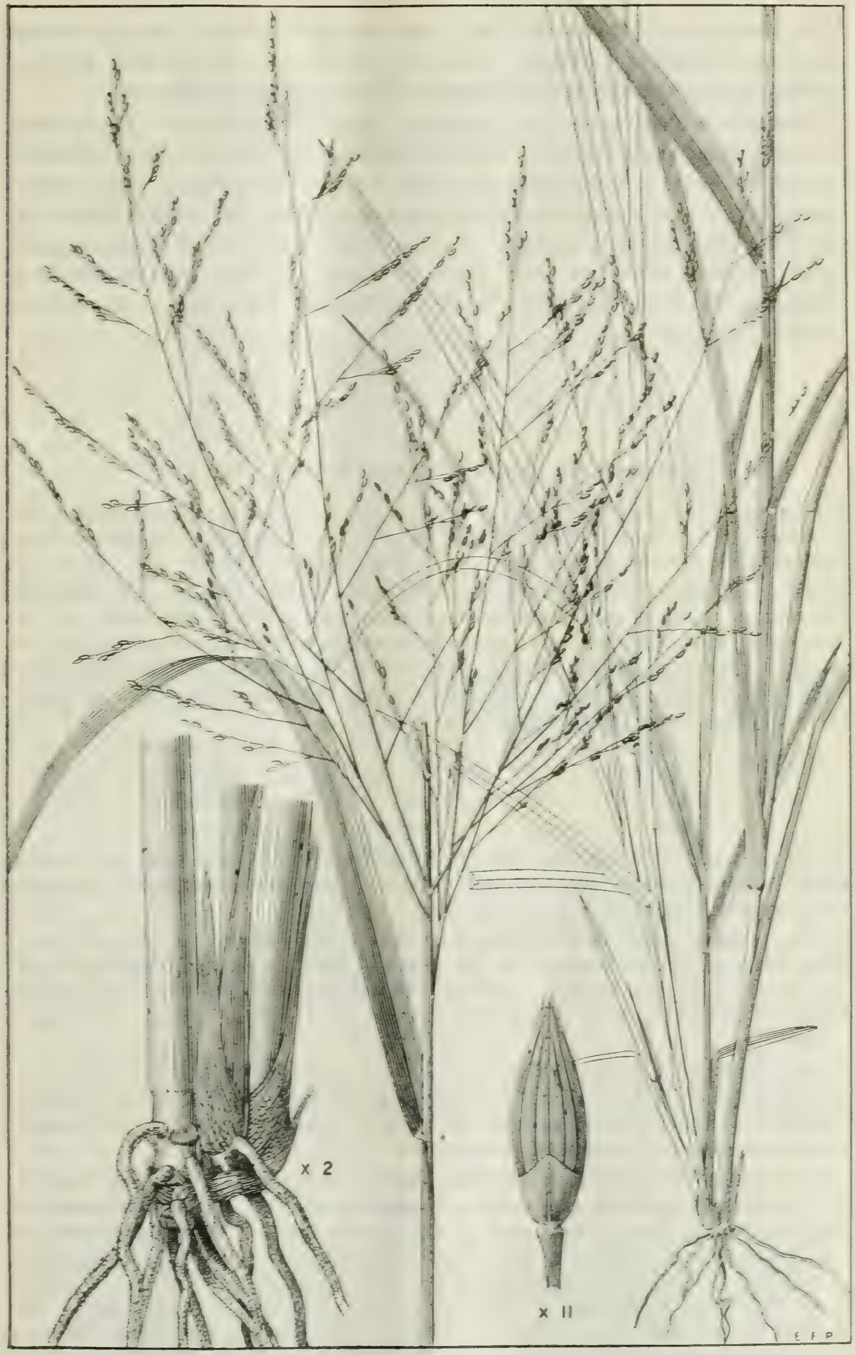


Fig. 3.—Native Millet (*Panicum decompositum*).
Although the root system is not as vigorous as in the other grasses illustrated, drought resistance is probably provided for by the dense leaf sheaths protecting the root-stock.

POPULAR DESCRIPTIONS OF GRASSES.

If it produces an abundance of feed under such conditions it can be turned into splendid hay or ensilage. It is very sensitive to frosts, and the flag entirely disappears during the winter season, but its root is perennial.

Native millet has been very successful under cultivation at Cowra and Nyngan Experiment Farms. At both places a good stand was established by sowing the seed, and considering that the seed germinates very readily (up to 70 per cent.), and also taking into account that the seeding habits of this grass are probably superior to those of the other native Panic grasses grown under cultivation, this grass is likely to come into favour as a promising Panic grass to place under cultivation even sooner than those hitherto mentioned.

(*To be continued.*)

CASTOR OIL PRODUCTION IN AUSTRALIA.

SUPPLEMENTING the information contained in Mr. H. Ross' article on "Castor Oil" in the December issue, Mr. W. B. Alexander, Secretary to a Special Committee on the Castor Oil Plant (appointed by the Advisory Council of Science and Industry), writes that within the last few years an increasing amount of castor oil has been extracted in Australia by a Melbourne firm from beans imported from India and Java, and last year the amount produced locally was greater than the amount imported. The quantities of beans used by Australia during the last three financial years for which figures are available were as follows:—

Year.	Tons.	Bushels of 46 lb.
1914–15	3,700	180,400
1915–16	2,700	133,500
1916–17	2,900	140,400

These figures have been arrived at by adding to the quantities of beans actually imported the quantities which would have been required to produce the imported castor oil.

The pre-war price paid by the firm was from 10s. 3d. to 13s. per cwt., depending on the oil content of the beans. This is equivalent to a price of 4s. 2d. to 5s. 4d. per bushel. During the war the price paid has been much higher than this, and it is doubtful whether it will ever return to so low a figure again.

Mr. Alexander adds, "There can be no question that the crop is a speculative one in Australia at present, especially as there is no information available as to the most suitable varieties to grow, nor as to the cultural treatment suited to Australian conditions.

"It was in view of these facts that the Commonwealth Advisory Council of Science and Industry appointed a Special Committee to collect all available information on these points and to assist individuals who are prepared to undertake the experimental cultivation of castor oil in every way possible. A number of varieties are being grown experimentally in Victoria, Queensland, and West Australia, in addition to the experiments being carried out in New South Wales, and it is hoped that before next spring there will be more information available to guide Australian farmers who wish to grow this crop."

Farmers' Experiment Plots.

MAIZE EXPERIMENTS, 1917-18.

North Coast District.

G. C. SPARKS, Assistant Inspector of Agriculture.

MAIZE experiments were provided for at ten centres as follows:—

F. T. Johnston, Condong.
G. A. Forrest, Coraki.
Charles Oliver, "Laureldale," Yorklea.
G. P. Collins, "Colindale," Fairy Hill.
Wm. Barnes, "Heatherdene," South Woodburn.
E. Amps, "Goldsbrough," Camira Creek.
John Wilson, Coramba.
Frank Allard, "Glenrose," Brooklana.
Henry Short, Dorrigo.
C. J. Rogers, Stuart's Point.

The season proved itself to be a particularly disastrous one for maize culture. Following a dry and very frosty winter there was little possibility of planting until the weather "broke," and from this point the precipitation was so great as to make experimental work almost hopeless. At some centres the soil was never dry enough to plant; at others, all cultivation being rendered impossible, the maize crop was smothered by weed growth. As was to have been anticipated, Leaf Blight made an early appearance, its ravages being unchecked, and even at more favoured centres where the crop came to maturity, Ear Rot was very prevalent. Taking the foregoing into consideration, the fact that returns were secured from only four experiments is not to be wondered at.

The Coramba Plot.

This experiment was on a light alluvial soil, fairly characteristic of the Orara flats. The paddock had been cropped to oats, and towards the end of August the stubble was turned under in preparation for the early November seeding. It was flooded early in this month, however, and the continuous wet weather prevented the final preparations for planting until 11th December. The plots came up well, but the subsequent growth was retarded by the excessively moist conditions experienced. Towards the middle of February the majority of the plots were in full tassel and all more or less infected with Leaf Blight. With the exception of Yellow Mastodon the cobbing was fairly satisfactory throughout, but as the season advanced the only varieties to withstand the adverse conditions were Improved Yellow Dent and Pale-cap Horsetooth, the others proving a total failure.

A plot of stud Improved Yellow Dent was included in this experiment, and at a young stage showed stronger vegetative growth than the other plots of the same variety. Unfortunately, however, a wind storm severely damaged the "stud" plot and the yield was slightly below that of the others. The stud seed has done particularly well at other centres, and its performance will be watched with considerable interest next season.

For the first time the application of artificial manures at Coramba was attended with failure. The results of past experiments have been so uniform, however, that this one failure can have very little influence upon the question.

The outstanding feature of this experiment is the way in which Improved Yellow Dent withstood the rigors of the season. Having been the highest yielding maize over a period of dry and normal years, the fact that it maintained its position in a season of abnormal moisture only serves to emphasise its superiority. The effective rainfall at Coramba was 36·28 inches.

The South Woodburn Plot.

This experiment was on a sandy soil of low average fertility, but characteristic of a class of country upon which a large amount of maize is grown. The usual methods of preparation were adopted, and seeding was carried out under favourable conditions. The growth was, of course, not quite so strong as upon superior soil, but a particularly healthy appearance was presented throughout, as, owing to the sandy nature of the soil, the excessive rainfall had no marked detrimental effect.

The manured plots showed a very satisfactory increase of yield in this experiment, 2 cwt. superphosphate per acre producing a 40 per cent. greater crop than the unmanured plot.

The Fairy Hill Plot.

This was on a dark, medium heavy volcanic ridge. Potatoes had been planted here but the crop was destroyed by the November rain, and as soon as it was dry enough to admit of working it was reploughed, and the maize plots planted on 27th December. At Fairy Hill an effective rainfall of only 19·73 inches was recorded, the lowest of the series, and the crop was relatively more uniform as regards growth and yield. The surprise of the trial was the performance of Giant White, which outyielded Improved Yellow Dent by 6 bushels per acre. None of the other varieties came within measurable distance of these two. Before harvesting Mr. Collins was firmly of the opinion that Improved Yellow Dent would be at least a 10-bushel crop better than Giant White, but upon weighing it was found that while the total cob weights showed very little difference the percentage of grain was much higher in the white variety.

The Yorklea Plot.

The soil upon which this experiment was conducted is a brown volcanic ridge, this being its first cropping. The initial ploughing was given early in June, and the ground allowed to lie rough and subject to the mellowing influence of the winter weather until mid-September, when it was again ploughed and harrowed. Another ploughing was given to overcome the compaction brought about by the heavy rain, and the soil worked down. It was in capital order at seeding on 17th December, and the plots came up well, displaying a very even growth.

The results of the variety trial are, however, upset by the fact that the Golden Beauty, Golden Nugget, Giant White, and Pale-cap Horsetooth plots were badly damaged by crows, and as the yields of these plots were greatly reduced thereby, the figures submitted in Table A are approximate only. Improved Yellow Dent again yielded heavily, and bore out the impression formed by last season's results.

Fertiliser Trials.

The manurial trials at Yorklea were the most extended, conclusive, and satisfactory of the series. The results will be found together with those of the other experiments in Table B. It will be noted that while the 2 cwt. dressing of superphosphate gave an increase of 22 bushels over the unmanured, 1 cwt. superphosphate gave 21 bushels increase; and charging the manure at 10s. and 5s. respectively, it will be understood that upon this occasion the latter was financially the sounder proposition. The addition of ½ cwt. nitrate of soda six weeks after planting to 1 cwt. superphosphate drilled in with the seed, was less successful than superphospate alone. In this experiment was included a mixed fertiliser containing 60 per cent. superphosphate, 20 per cent. sulphate of potash, and 20 per cent. bone-dust, which had been a great success in other parts of the world, but the results were disappointing, for while it gained 12 bushels against the unmanured plots, it fell far behind those dressed with superphosphate alone.

TABLE A.—Results of Maize Variety Trials,
North Coast, 1917–18.

Variety.	Coramba.		Fairy Hill.		South Woodburn.		Yorklea.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Improved Yellow Dent ...	58	17	51	8	30	0	45	20
,, ,, ,, (Stud)	57	33*	......		.....		......	
Leaming	failed.		39	20	41	29	48	27
Red Hogan	failed.		25	40	......		46	39
Springrove Surprise	......		34	16	26	39	48	27
Golden Nugget	......		46	32	23	22	44	31*
,, Beauty	failed.		39	44	18	39	39	1*
Giant White	failed.		57	12	31	34	40	5*
Craig Mitchell	failed.		30	8	26	34	37	8*
Pale-cap Horsetooth	45	5	......		......		36	39
Hickory King	failed.		32	16	34	16	......	
Silvermine	......		30	20	24	31	......	
Yellow Mastodon	failed.		......		......		... ..	
Goldmine	......		......		30	0	......	
Gold Standard Leaming ...	......		......		24	16	......	

* Damaged—yields reduced.

TABLE B.—Results of Manurial Trials, North Coast, 1917-18.

Variety used in all plots—Improved Yellow Dent.

Manure, and Amount per acre.	Coramba.		Fairy Hill.		South Woodburn.		Yorklea.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Superphosphate, 1 cwt.	44	51	51	36	38	43	66	44
,, 2 ,, ...	58	17	52	16	42	28	67	38
,, 1 ,, ... Nitrate of Soda, ½ ,, ...	44	51	......		......		62	48
P7 Mixture, 2 cwt.*	40	25	44	24	41	24	62	33
No manure	58	42	51	8	30	0	45	20
Superphosphate, 60 per cent. Sulphate of Potash, 20 per cent. Bone-dust, 20 per cent. ... } 2 cwt.	......		......		......		57	23

* P7 Mixture consists of equal parts of superphosphate and bone-dust.

TABLE C.—Field Notes on Varieties of Maize, North Coast, 1917-18.

Variety.	Height of Stalk.	Height of Ear.	Percentage of Stalks with 2 Ears.	Amount of Suckering.	Husk Covering.	Period of Maturity.
Improved Yellow Dent ...	12 feet	6 feet	2	Nil	Excellent	22 weeks.
Leaming	9 ,,	4½ ,,	1	Slight	Good	18 ,,
Red Hogan	11 ,,	5½ ,,	...	,,	Fair	24 ,,
Springrove Surprise ...	9 ,,	5 ,,	...	,,	,,	19 ,,
Golden Nugget	10 ,,	5 ,,	...	Nil	Good	19 ,,
,, Beauty	10 ,,	5½ ,,	...	Slight	,,	17 ,,
Giant White	10 ,,	6 ,,	...	Nil	,,	20 ,,
Craig Mitchell	11 ,,	4½ ,,	...	Slight	Fair	19 ,,
Pale-cap Horsetooth ...	12 ,,	6½ ,,	...	,,	Good	23 ,,
Hickory King	9 ,,	5 ,,	2	,,	Fair	18 ,,
Silvermine	7 ,,	3 ,,	2	Heavy	,,	17 ,,
Goldmine	8 ,,	4½ ,,	...	Slight	,,	17 ,,
Gold Standard Leaming ...	9 ,,	4½ ,,	1	,,	Good	18 ,,

These notes were collected in a particularly wet season and following late plantings. It is hoped that much more reliable data will be secured next season.

Farmers' Experiment Plots.

POTATO EXPERIMENTS, 1917-18.

North Coast District.

G. C. SPARKS, Assistant Inspector of Agriculture.

THE experiments of the past season were attempted at nine centres, the distribution and personnel of the experimenters being as follows:—

F. T. Johnston, Condong, Tweed River.
Charles Oliver, Laureldale, Yorklea.
G. P. Collins, Colindale, Fairy Hill.
G. A. Forrest, Coraki.
John Wilson, Coramba.
Frank Allard, Glenrose, Brooklana.
Henry Short, Dorrigo.
E. A. Marsh, Macksville.
J. G. Ward, Sherwood.

The seeding was carried out under favourable conditions, and germination was, on the whole, excellent. The copious rains of early summer brought about a most satisfactory vegetative growth, the flowering was exceptionally profuse, and at the end of October the crop prospects were of the brightest.

The North Coast potato crop is, however, almost wholly produced on alluvial flats adjacent to the banks of the various rivers, and the extraordinary precipitation of the eventful night of the 9th November was responsible for the destruction of the majority of the experiments. On the morning of 16th November the Coraki and Macksville plots lay under 6 feet of water, and although at other centres the extremes were less sensational the effects were as acute.

The Dorrigo experiment was situated on high ground, and although severely damaged by the rush of storm water, would have survived but for an outbreak of Late (Irish) Blight which, favoured by the dull, cool, very moist conditions of mid-November, made tremendous headway and gained a firm hold upon the crop.

Taking the foregoing into consideration, the fact that the Coramba, Sherwood, and Brooklana plots withstood all difficulties and yielded satisfactorily is decidedly gratifying.

The Coramba Plot.

The soil upon which this experiment was conducted is a dark and somewhat heavier alluvial than is common upon the Orara flats. In preparation for the potato experiment the débris resulting from the maize crop was ploughed in during the autumn and field peas sown. The winter under review proved, however, one of the driest and most severe recorded at Coramba, and the growth of the peas was so slight as to defeat the object of their planting. The paddock was lightly ploughed early in August, and the seeding of the experiment carried out on 20th and 21st of that month—furrows being opened with the mouldboard plough, the sets dropped by hand and covered with the harrow. A rolling was given in order to compact the soil about the sets, and was followed by a light harrowing to adjust the condition of the surface soil. The seed-bed was particularly fine and deep if somewhat dry, but although a period of dry, windy weather succeeded planting the germination was excellent and a satisfactory growth maintained throughout. The flood of November touched portion of the experiment, but only while the water was at its height, the period of immersion being not more than half an hour, no apparent damage resulting. At Coramba and at the other centres the after-cultivation of the crop was beyond reproach. Great reliance is now placed in the early harrowings—when the crop is showing through the ground, and again when at a height of 4 or 5 inches; constant and unremitting attention was given with the scuffler and the hilling completed at the psychological moment. Throughout the growing period the plots presented a particularly pleasing appearance—no weed growth being visible and the soil being maintained in an eminently satisfactory state. The effective rainfall at Coramba was 21·89 inches.

The Sherwood Plot.

This experiment was carried out on a sandy alluvial soil that has been under cultivation for upwards of thirty years. The residue of the previous season's maize crop was turned under in early winter and the soil allowed to lie rough and open until the end of July when it was again ploughed and worked down. The seed-bed was dry but otherwise in good order. The drills were opened with the plough and the sets covered with the hoe, ample assistance being available. The germination was not as successful here as at the other experiments—Carman No. 1 coming up rather weakly and Manhattan and Early Manistee being below the average. Rainfall, 20·54 inches.

The Brooklana Plot.

This experiment was on a heavy yellow volcanic soil, characteristic of the eastern slopes of the Dorrigo plateau. The paddock, which had only been cropped once before, was ploughed early in July, again towards the end of August, and was harrowed twice in September. Seeding was commenced on 27th September, the details of this and subsequent operations being identical with the other trials. Rainfall during growth, 34·08 inches.

Conclusions.

The drawing of definite conclusions from this series of experiments is, in part, rendered impossible by the small percentage of experiments that reached maturity and by the fact that the season was decidedly abnormal, but it would certainly appear that all the varieties at present undergoing trial are worthy of further attention. While the standard North Coast varieties maintain their position, it may be noted that there is a growing popularity of Up-to-Date in the southern portion of the district, which impression is now strengthened by the fact that at the Sherwood experiment plots Up-to-Date outyielded Manhattan by 11 cwt. per acre. The main objection to Up-to-Date is the high percentage of small tubers which it produces; but, as against this, its table qualities are regarded as being relatively higher than the standard varieties. There seems to be a yearly improvement in Carman No. 1 and Early Manistee, and both have been grown with considerable success by farmers interested in the production of potatoes for home consumption only; their superior table qualities more than overcome the disadvantage of their lighter yielding capacity when considered from this viewpoint.

Queen of the Valley and Coronation are popular in the cooler and drier portions of the coast, although the tendency of the latter towards second growth has always to be feared. The outstanding feature of the variety trials is, however, the performance of a new variety—"Factor." It will be seen by reference to Table A that at two of the three experiments it outyielded all other varieties; and, further, its table qualities were infinitely better than those of any variety that underwent trial in this series of experiments. Factor is a white-skinned potato, and is believed to be a selection from Up-to-Date. It will be extensively tried next season, and it is to be hoped that the results will prove as satisfactory as heretofore, as the need is acute for a heavy-cropping variety of good table quality, capable of withstanding the rigors of the climate of the North Coast.

Manurial Trials.

These were included at each centre, and the results will be found in Table B. It will be noted that this section is divided into five plots, two being dressed with superphosphate at the rate of 2 cwt. and 3 cwt. per acre respectively, two receiving applications of the mixed fertilisers P5 and P7 respectively, and one no manure. In considering these results, it must be remembered that it is insufficient to show a mere increase of yield—the increase must be great enough to pay the cost of the manure, and to allow a substantial margin of profit. This is, of course, quite apart from the consideration that the use of artificial manures tends to minimise the exhaustion of plant food in the soil.

At Coramba the 3 cwt. superphosphate dressing increased the yield as against the unmanured plot by 2 tons 18 cwt. per acre, and basing the cost of the manure at 15s. per acre and allowing £6 per ton for the potatoes, the profit over the cost of the manure would be approximately £16 per acre. At Brooklana the advantages of manuring are even more pronounced, the 3 cwt. P7 application, costing 22s. 6d. per acre, showing a profit of almost £30 per acre. Actually the difference is even greater than the last figures indicate, for while the whole of the manured plots of the Brooklana experiment produced tubers showing great size and uniformity, the product of the unmanured plot contained a tremendous amount of small tubers—in fact, if a sample uniform with that secured from the manured plots were selected, the yield of the unmanured plot would be considerably reduced, the actual figures being, in round numbers:—

Manured with P7 mixture	6¼ tons per acre.
Unmanured	6¼ cwt. ,,

At Sherwood the results, as far as one season's work goes, fail to justify the use of artificial manures. It will be remembered, however, that this soil has been under cultivation for many years, and although it has been farmed on sound lines, its humus content does not compare in any way with the "young" soils of the Coramba and Brooklana experiments. Although the 2 cwt. superphosphate and the P5 plots both show increased yields at Sherwood, the margin was insufficient to render the application profitable.

To sum up—the use of artificial manures can be strongly recommended on the North Coast, provided that the soil carries a sufficiency of organic matter. At Coramba and Brooklana the soils were in fine shape, and the results highly satisfactory; but at Sherwood, on a soil depleted of humus, there was no response, and before the application of artificial manures to a soil of this type is likely to become profitable, it must be built up by green manuring, and the turning under of crop residues.

TABLE A.—Results of Potato Variety Trials, North Coast, 1917–18.

Variety.	Coramba.				Sherwood.				Brooklana.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Factor	8	6	0	25	5	16	3	4	3	17	3	12
Manhattan	6	11	1	5	4	14	3	8	4	18	3	10
Coronation	6	4	1	24	....				4	8	0	4
Up-to-Date	6	0	1	7	5	5	0	0	3	18	1	26
Satisfaction	5	9	3	2	4	2	0	6	4	19	1	8
Carman No. 1	5	6	1	17	2	12	0	6	2	7	0	6
Early Manistee	5	1	3	14	3	16	1	20	3	4	3	8
Queen of the Valley ...	....				....				5	2	1	8
Langworthy	....				....				4	2	2	10
Surprise	....				....				3	11	2	12

TABLE B.—Results of Manurial Trials with Potatoes, North Coast, 1917–18.

Manure and Amount per acre.	Coramba.				Sherwood.				Brooklana.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Superphosphate, 2 cwt. ...	6	4	1	24	5	5	0	0	3	18	1	26
,, 3 ,, ...	6	15	0	0	4	10	1	12	4	11	1	20
P5 Mixture, 2½ cwt. ...	5	16	2	12	5	6	2	2	3	8	0	24
P7 ,, 3 ,, ...	6	12	0	16	4	16	0	8	6	6	3	14
No manure	3	16	3	4	5	2	3	2	1	5	1	22

P5 2½ cwt. = Superphosphate 2 cwt. + Sulphate of potash ½ cwt.
P7 3 cwt. = Superphosphate 1½ cwt. + Bone-dust 1½ cwt.

At Coramba, Coronation was the variety used for the manurial trial; at Sherwood and Brooklana, Up-to-Date.

Farmers' Experiment Plots.

Winter Fodders, Lower North Coast, 1918.

J. M. PITT, Assistant Inspector of Agriculture.

EXPERIMENTS with winter fodders have been carried on in conjunction with farmers on the North Coast for a number of years now, with results highly satisfactory, both to themselves and to the Department. Still, it is with regret that one has to state that the majority of men engaged in the dairying industry, especially in these districts, fail to realise the advantages to be gained by the growing of crops to tide them over the leaner months of the year. Even in average seasons feed is scarce and pastures at their lowest during the late winter and early spring months, yet it is only here and there that one comes across a farmer progressive enough not only to keep the milk supply up at a time when most dairy produce is realising high prices, but to hold his cows in the condition to "jump" straight into full milk, when the natural spring growth takes place, without his herd first having to "build up," a practice now too much in evidence on the non-progressive farm.

The object of the Department in carrying out these experiments on the Farmers' Plots is to supply to those in the surrounding district, data as regards the most suitable varieties of crops to grow; to demonstrate reliable cultural methods; and further to show the farmer that the methods, as practised, are not out of reach of his pocket, nor are too elaborate for him to undertake. The Department has been fortunate in having such an enthusiast as Mr. R. Richardson, "Bellevue," Mondrook, Tinonee, Manning River, to carry out the work, and it is chiefly due to his energies that the results obtained this season probably constitute a record.

An analysis of the distribution of the rainfall over the period, from sowing to harvesting time, shows that the season was comparatively a dry one, thus accounting for the almost total absence of rust (*Puccinia graminis*). Although the heavy rains of the early autumn were instrumental in delaying planting operations, and necessitating extra work, such as skim-ploughing, cultivating, &c., to check weed growth, still an excellent seed-bed was prepared. Good rains in July gave the plots a flying start. Strong gusty winds, accompanied by heavy rains early in September, caused considerable lodging, still the crops affected lifted sufficiently to obtain a clean cut in October.

The rainfall was as follows:—April, 418 points; May, 137; June, 55; July, 315; August, 191; September, 386; October, 78 points.

The date of sowing (7th June) was rather late from the point of view of an early supply of winter and early spring fodder, still by the middle of September most of the plots, chiefly the earlier maturing varieties, had reached a height of 3½ to 4 feet, and promised well for hay. By using a little judgment in selecting the right varieties to grow, and getting the first sowing in, say, towards the end of March, or early in April, and continuing with earlier or later maturing varieties as the occasion may warrant, a plentiful supply of green fodder should be available from early in August to practically the end of October, by which time the spring growth in the pastures should be well advanced. Mr. Richardson was fortunate in having green lucerne available for his herd, thus allowing him to utilise most of the plots for hay, a very profitable move considering the high prices ruling for chaff during the latter part of the year. This fact alone should be an incentive for other farmers in the district to be up and doing. Incidentally it may be mentioned that when growing for hay it is rather a disadvantage to sow early-maturing varieties, or in fact any variety too early owing to the likelihood of encountering unsuitable hay-curing weather in the early spring. May and June sowings have given good results.

A rush of other work on the farm somewhat delayed weights being taken at the proper time, the late-maturing wheats and Algerian oats thus gaining an advantage over the earlier maturing varieties. For a number of years Thew and Huguenot have proved their superiority over most other varieties for giving the heaviest yield in the shortest time, and it may again be safely stated that had weighings been taken at an earlier period, this fact would probably have again been borne out. Clarendon, one of the best of recent introductions, and a fairly early maturer, showed great promise, and its inclusion for further trial on the coast is strongly recommended, especially for green fodder. Cleveland, on the other hand, did not come up to expectations, its rather backward growth during the earlier stages practically rendering it unsuitable for this purpose ; still it makes a very good hay.

Firbank, Florence, and portions of the Thew, Warren, Cleveland, and Algerian plots—in the order mentioned—were the varieties affected most by the rough September weather.

The heaviest yield on all the plots stood to the credit of Algerian oats, but it may be mentioned that this position is due mainly to its being a later maturer, thus reaping the benefit from rains that would be useless to the much earlier maturing varieties of both oats and wheat. Sunrise and Ruakura performed very creditably, although they do not stool nearly so profusely and are much coarser in the stems than Algerian.

On two plots of Huguenot, Egyptian Field peas and Golden tares were included to compare with a plot sown with Huguenot alone, but the increases in yield were not as pronounced as in former experiments, the comparative dry season not being suited to the heaviest growth of legume. The practice of growing a legume with a cereal has been in vogue for a number of years with satisfactory results, for besides supplying a better mixture, the land is not impoverished to the same extent as when the cereal is grown alone.

Huguenot, owing to its quick strong growth, lends itself admirably to the inclusion of peas or tares, the extra weight it has to bear not doing the damage one would imagine, excepting of course in very wet seasons.

The soil on which the experiment was carried out is a rich alluvial river soil, typical of the Manning River flats.

Previous cultivation : The land was ploughed in October and December, 1917, skim-ploughed three times, and harrowed and cultivated eleven times, between December and June, 1918. The seed was broadcasted on 7th June. The following table gives the details of weights, &c., harvesting operations extending over the last week in October, and early in November.

Variety.	Quantity of Seed per acre.	Yield of Green Fodder.	
		tons	cwt.
Thew Wheat	2 bus.	11	8
Florence Wheat	2 ,,	11	14
Firbank Wheat	2 ,,	12	1
Clarendon Wheat	2 ,,	13	0
Cleveland Wheat	2 ,,	10	7
Warren Wheat	2 ,,	11	14
Huguenot Wheat	2 ,,	13	13
Huguenot Wheat ... ... Golden Vetches	2 bus. 30 lb.	14	2
Huguenot Wheat ... ... Egyptian Field Peas ...	2 bus. 10 lb.	14	9
Algerian Oats	3 bus.	18	9
Ruakura Oats	3 ,,	16	17
Sunrise Oats	3 ,,	17	13

Sale of Purebred Guernsey Stud Cattle at Wollongbar Experiment Farm.

A sale of purebred Guernsey Stud Cattle will be held at the Government Experiment Farm, Wollongbar, on Wednesday, 26th February, at 1 p.m., by Messrs. Hindmarsh & Co., Auctioneers, Molesworth-street, Lismore, in conjunction with Messrs. Rutherford, Shannon, and Gordon, Auctioneers, Lismore. The lot to be offered will comprise seventeen cows, three heifers, and sixteen bulls—these being fine specimens of stock bred by the Department.

Catalogues giving full descriptions of the stock offered may be obtained on application to the Under Secretary and Director, Department of Agriculture, Sydney, the Manager of the Wollongbar Experiment Farm, Lismore, and the Auctioneers.

Saccaline at Wollongbar Experiment Farm.

In the article on this subject in the December issue, Mr. A. H. Haywood attributed the introduction of Saccaline to the district to Mr. George Elliott, of Woodburn, Richmond River. He now finds that it was Mr. Frank Elliott, also of Woodburn, who first planted the crop on the Richmond River, paying 2s. 6d. per lb. for the seed.

CASTOR OIL v. MAIZE.

THE following comparison may be made with regard to the production and returns from Castor Oil and Maize. It is assumed that the land is of good quality and equally suitable for both crops.

	CASTOR OIL.	MAIZE.
Rental value of land.	Similar	Similar.
Ploughing and general cultivation.	Similar	Similar.
Seed	Cost per acre somewhat less than maize, but must be steeped and sown by hand.	Usually sown with dropper.
Thinning	Must be thinned to one plant per hill.	Not necessary.
Pinching back ...	Must be carried out to reduce the height.	Not necessary.
Harvesting ...	Three or four pickings necessary, and these must be done before the capsules burst.	Can be pulled weeks after ripening when other farm work is slack.
Turning in shed ...	Must be done once a day for four or five days.	Not necessary.
Average yield ...	20 bushels per acre (as far as can be ascertained).	40 to 50 bushels per acre.
Price (pre-war) ...	4s. 2d. to 5s. 4d. per bushel (46 lb.) at mill.	3s. 6d. to 4s. per bushel (56 lb.) on farm.
Uses of seed ...	Must be sold to mill for oil extraction (no other use for it).	Can be marketed "on the hoof" or in the bag, or used for horses, fowls, &c.
Uses of plant (other than seed).	None...	Stalks and husks make useful roughage for stock.
In the event of failure of seed crop.	Quite useless	Whole plant can be used for stock feed.
Risks attending growing of crop.	Seeds poisonous. Plant proclaimed as a noxious weed in many shires.	Harmless.
Effect on soil ...	Considered to be very exhaustive on soils, and should not be grown more than once in six or seven years.	Not unduly exhaustive on soils and often grown every year, though rotation is desirable.

Sheep and Wool for Farmers.

CROSS-BREEDING EXPERIMENTS.

THE WOOL AND MUTTON TYPE.

[Continued from Vol. XXIX, page 490.]

J. WRENFORD MATHEWS.

Bathurst Experiment Farm and Combined Results.

THE publication of this report has been delayed, pending the completion of the 1918 shearing, so as to permit of that year's records being included. In addition to figures from Bathurst Farm, which are embodied in this report, similar particulars are furnished from Wagga and Cowra farms. The inclusion of the 1918 returns bring these experiments to a stage at which it is possible to summarise their progress. It marks the period when they practically cease at Wagga. Another year has still to run before they come to a conclusion at Bathurst and Cowra farms, but the sheep are all of the older ages, and the results are not likely to be affected by the last year's returns.

Previous Reports.

In the issue of this *Gazette* for July, 1918, figures were given comparing the differences between the crosses up to the 5-months' stage, but the results are now available for practically all ages from 1 year 5 months to 5 years 5 months in the case of the wethers, and from 1 year 5 months to 8 years 5 months in the case of the ewes. In the case of Bathurst and Cowra farms the records are for four lots of wethers at each age, except in the case of those 5 years 5 months old, for which only three years' records are available. But for the fact that they have been carried for a longer period, similar particulars are furnished in the subjoined tables for the ewes. Had the experiments been commenced at the same time at all three farms the results might have shown greater uniformity.

As it is, Cowra and Bathurst being a year behind Wagga in entering upon the work, the returns of only three lots from the first two farms can be given at each year up to 5 years 5 months old, as against four lots in the case of the last farm. Similarly, while Wagga affords particulars of three lots of ewes at 6 years 5 months, two lots at 7 years 5 months, and one lot at 8 years 5 months, Bathurst and Cowra can only supply the particulars of two lots at 6 years 5 months, and one lot at 7 years 5 months, while there are none at all at 8 years 5 months old.

In the cases of Wagga and Cowra, reports have already been published of portion of the results. Those as to Wagga up to the shearing of 1913 appeared in the *Gazette* in February, June, July, and August, 1914, and those as to Cowra up to the 1915 shearing in the *Gazette* in May and June, 1916. The figures obtained year by year in the interval are included in averages in the latter part of this article, which thus brings a considerable quantity of data quite up to date.

The results obtained at the Bathurst Farm are shown first, those from the other two farms separately (but averaging the results obtained in successive years for sheep at different ages), and finally the averages are consolidated to show the combined results.

It should here be explained that this report deals only with body and fleece weights. The classification, the clean scoured yield, and the relative values of the wool produced by the different crosses will be made the subject of a separate article.

The Capability of the Parents.

Before proceeding to set out those particulars, it may be well first to give some idea of the standard of the parents. Almost anybody knows that the standard of excellence or merit of the progeny depends mainly on that of the parents. Though seen, perhaps, in a higher degree in purebred stock, this nevertheless is true also in the case of a crossbred.

In these trials, only fair average specimens of the breeds represented have been employed. The ewes were not above the ordinary flock class, though carefully selected for uniformity and type. They were, indeed, such as any ordinary farmer may profitably use for the purpose. Much the same may be said of the rams, which did not rank above the standard of average flock animals. The object was to ensure that the whole of the trials were conducted on strictly commercial lines. The sheep were run in accordance with ordinary farm practice, and except to see that they were provided with an adequate supply of feed, as seasonal variations might necessitate, no special provision was made for them.

The rams, like the ewes, were carefully selected in order to maintain the identical features and typical wool-bearing characteristics of each of the breeds. In order that no misapprehension shall exist on this score, and in order that the standard of the progeny may be traced through the parents, a table is inserted giving the body and fleece weights of all rams used in the trials.

TABLE I.—Average Body and Fleece Weights of Rams used in the trials at Bathurst Experiment Farm.

Breed.	Weights.	
	Body.	Fleece.
	lb. oz.	lb. oz.
Lincoln	175 8	16 4
Leicester	166 3	12 4
Border Leicester	167 8	9 0

Consolidating similar figures for all three farms the following are the average body and fleece weights of all rams that have been employed in these trials :—

	Lincoln.		Leicester.		Border Leicester.	
	lb.	oz.	lb.	oz.	lb.	oz.
Body	168	10	173	12	178	8
Fleece	15	10	11	13	10	0

As these figures represent the body and fleece weights for all rams that have been used during the whole of the matings (four years at each farm), and at all ages up to the full-mouth stage, they afford a very fair criterion of the respective merits of the breeds represented. Indeed, reviewing the figures in the light of past statements, they coincide fairly accurately with the classification set out on page 51 of *Farmers' Bulletin*, No. 53, "Sheep and Wool for Farmers."

The recording of these particulars year by year has enabled the merits of these different breeds to be contrasted on the basis of body and fleece weights and of early maturity. Representing, as they do, a family of correlated types, it will be interesting now to see how their different qualities have been transmitted to their descendants through the Merino ewe.

Similar details have been collected and recorded for the ewes. Unlike the rams, no means are available for making distinctions as they were all similar in class, but from a knowledge of the characteristics of the ewes we are enabled to gauge to what extent the qualities of the rams have become modified or accentuated in the progeny.

As before, the fleece weights are given for the Bathurst Farm first, then those for the other farms, and finally the averages for the full number are presented in tabular form.

Table II.—Average Fleece Weights of groupsof Merino ewes mated with different Longwool rams at Bathurst Experiment Farm.

Ewes mated with—	1911.			1912.			1913.			1914.		
	No.	Average Fleece Weight.		No.	Average Fleece Weight.		No.	Average Fleece Weight.		No.	Average Fleece Weight.	
		lb.	oz.		lb.	oz.		lb.	oz.		lb.	oz.
Lincoln	42	9	4	47	5	15	47	12	10	46	10	3
Leicester	41			48	5	14	47	12	11	46	10	10
Border Leicester ...	40			48	6	4	47	12	11	46	10	8

Through an oversight the groups were not divided on the occasion of the 1911 shearing, but we have the records of those for all the remaining years. For the full period, the average works out at 9 lb. 9 oz., but the most striking feature of the figures is the manner in which the sheep lose and regain their weight of fleece in sympathy with seasonal variations. For instance, if the figures for 1912 and 1913 are compared, it will be seen that a group of sheep that in 1912 averaged only 6 lb. of wool, in 1913 yielded an average of 12 lb. 11 oz. It may be emphasised that these were identically the same sheep. The variation was wholly attributable to the nature of the season, for the same sheep, when shorn as hoggets, had given an average weight of 12¾ lb. of wool.

Subjoined are two tables giving similar details of the ewes used at Wagga and Cowra farms:—

AVERAGE Fleece Weights of Ewes at Wagga Experiment Farm.

1910.		1911.		1912.		1913.	
No.	Fleece Weight.	No.	Fleece Weight.	No.	Fleece Weight.	No.	Fleece Weight.
	lb. oz.		lb. oz.		lb. oz.		lb. oz.
189	6 12	166	9 0	197	5 15	185	8 12

For the full period the average weight was 7 lb. 8 oz.

Lincoln–Merino Cross at 2 years 5 months.
Bathurst Experiment Farm.

AVERAGE Fleece Weights of Ewes at Cowra Experiment Farm.

1911.		1912.		1913.		1914.	
No.	Fleece Weight.	No.	Fleece Weight.	No.	Fleece Weight.	No.	Fleece Weight.
	lb. oz.		lb. oz.		lb. oz.		lb. oz.
235	10 0	166	6 5*	240	9 6	150	8 0

* Average for wet ewes only.

The class of the ewes may perhaps be best judged from the statement that during the experiments at these farms 2,135 ewes were shorn (some of the same animals appearing several times, of course), the gross weight of 18,247 lb. wool was obtained, and the average yearly clip per head was 8 lb. 9 oz.

Body and Fleece Weights.

Coming to the review of the results from the main points for which the trials were primarily instituted, namely, the body and fleece weights :—

The investigations aimed at not only discovering the most profitable cross for wool and mutton combined, but at assembling data as to the age at which the crosses might be most profitably marketed. This information is essential not only in disposing of the wethers, but also in estimating the serviceableness of the ewes for breeding purposes. A wether can be "turned off" at a comparatively early age, but it is necessary to retain the ewes for a much longer period in order to breed from them. It was for this reason that only a limited number of wethers were retained each year, while the records of the ewes comprise all that were dropped. For a similar reason the wethers have not been carried beyond the 5 years 5 months stage, at which age they are far beyond their prime, or the age at which they may be profitably turned to account. But by recording the sexes separately at their various ages means are afforded of making comparisons of each sex at each age in each of the crosses

Leicester-Merino Cross at 2 years 5 months.
Bathurst Experiment Farm.

The ewes were used for breeding throughout, except at 1 year 5 months old, so that allowance should be made in noting their progress and comparing the corresponding averages for the wethers.

In preparing this report I have considered the form in which the information may be most conveniently made accessible. Tables at their best are undeniably tedious, but no other method so convenient is available for setting out the results.

The Wethers.

In addition to the body and fleece weights, the particulars have been augmented by the length, girth, and waist measurements, which enables the reader to see at a glance in what respects the different crosses differ. In each case these measurements were ascertained after the sheep had been shorn, and were taken (1) from nape or first joint of the neck, (2) over the wither and to the rear of the fore legs over the breast bone, and (3) encircling the body at about the junction of the rib and loin.

Owing to the fact that the condition of a breeding ewe is never as stable as that of a wether, these measurements were not ascertained for the ewes.

TABLE III.—Average Body and Fleece Weights, and Measurements of Wethers, at Bathurst Experiment Farm, 1912–18.

Cross.	No. of Wethers.	Body.					Fleece Weight.	
		Weight.		Measurements.				
				Length.	Girth.	Waist.		
1 year 4 months.		Year 1912.			Shorn 26th October.			
		lb.	oz.	inches.	inches.	inches.	lb.	oz.
L_1M	5	92	8	33	34	37	10	12
L_2M	6	89	0	30	34½	36½	9	8
L_3M	6	104	4	34½	35½	38½	10	2
1 year 4 months.		Year 1913.			Shorn 22nd October.			
L_1M	6	108	0	36¼	36½	39¾	13	9
L_2M	6	104	0	36½	36½	40	13	4
L_3M	6	133	8	40	39	43¾	13	1
2 years 4 months.								
L_1M	2	139	0	36	42	44½	15	4
L_2M	4	132	8	39½	40½	44	13	9
L_3M	3	159	10	42½	43½	46	13	4
1 year 4 months.		Year 1914.			Shorn 23rd October.			
L_1M	6	87	0	29	32¼	37	11	6
L_2M	6	94	12	30½	34	38	11	15
L_3M	4	115	4	31¼	36½	42	11	9
2 years 4 months.								
L_1M	6	114	0	30	37	40	12	10
L_2M	6	114	5	32¼	37	41½	11	15
L_3M	5	146	3	31	41	45	12	9
3 years 4 months.								
L_1M	2	125	10	30	38	42¼	12	12
L_2M	3	137	5	33	41	43½	12	13
L_3M	4	172	12	31¼	44¼	49½	12	14
1 year 4 months.		Year 1915.			Shorn 15th October.			
L_1M	19	99	7	30½	34½	38	11	12
L_2M	12	97	7	30	34	39	11	2
L_3M	13	116	13	32	37	41	10	12
2 years 4 months.								
L_1M	5	117	0	33	36½	41¼	12	9
L_2M	6	123	13	33½	38	42	11	15
L_3M	4	152	10	37¼	42¾	46¼	12	4

TABLE III.—Average Body and Fleece Weights, and Measurements of Wethers, at Bathurst Experiment Farm 1912–18—*continued.*

Cross.	No. of Wethers.	Body.					Fleece Weight.	
		Weight.		Measurements.				
				Length.	Girth.	Waist.		
3 years 4 months.		Year 1915.			Shorn 15th October.			
		lb.	oz.	inches.	inches.	inches.	lb	oz.
L_1M	6	141	0	37	40½	45	13	11
L_2M	5	132	6	35	39	42	12	1
L_3M	5	170	4	38½	44	48	12	3
4 years 4 months.								
L_1M	2	153	0	37¾	42	46	12	12
L_2M	3	151	2	38	43	44	12	7
L_3M	3	186	8	40	46	49	11	13
2 years 4 months.		Year 1916.			Shorn 10th October.			
L_1M	19	136	0	32	38½	44	13	5
L_2M	11	132	14	32	38½	44	12	14
L_3M	12	150	14	34¼	41½	45	12	3
3 years 4 months.								
L_1M	5	133	12	32	39	42¾	12	12
L_2M	6	138	11	33	40¼	45	11	11
L_3M	4	165	4	36	43¼	46	12	6
4 years 4 months.								
L_1M	5	149	3	34¼	42¼	45½	14	3
L_2M	4	130	8	32½	37¼	42½	10	8
L_3M	5	153	9	35¼	43¼	46	11	11
5 years 4 months.								
L_1M	2	152	8	33½	41	44	12	9
L_2M	3	146	11	33	41¾	43½	11	0
L_3M	3	165	0	36	43¼	46¼	10	4
3 years 4 months.		Year 1917.			Shorn 20th October.			
L_1M	19	146	6	31½	40½	42¾	13	2
L_2M	12	138	8	31	39½	41½	12	9
L_3M	13	169	2	32½	43¾	44¼	12	2
4 years 4 months.								
L_1M	5	164	8	31¼	40¾	42½	12	9
L_2M	4	151	9	31¼	42	43¼	12	5
L_3M	4	165	9	32	43¼	45	11	1
5 years 4 months.								
L_1M	5	145	8	32	41½	43	12	7
L_2M	4	164	9	32¼	43	44	10	9
L_3M	1	188	5	35	45	46	12	0
4 years 4 months.		Year 1918.			Shorn 19th October.			
L_1M	18	140	2	34½	40¼	40½	11	5
L_2M	12	126	1	34¼	38½	39	11	8
L_3M	13	154	8	36½	42	41¼	10	1
5 years 4 months.								
L_1M	5	131	2	35	40	41	11	2
L_2M	4	130	0	33½	39	39	11	5
L_3M	4	154	5	37	41½	42¼	9	9

The sheep were all machine shorn.

In scrutinising these figures it would be well first to compare the averages for different crosses individually, and then collectively in respective order of age and year. For the latter, it will be necessary to combine the results, and with that object the following summary, specifying the year's returns as well as showing the weights of the crosses at their various ages, has been made.

TABLE IV.—Average Body and Fleece Weights of
Wethers of various Breeds at each Year,
Bathurst Experiment Farm.

Cross.	Years Recorded.	No. of Sheep.	Weights.			
			Body.		Fleece.	
		1 year 4 months.				
			lb.	oz.	lb.	oz.
L_1M	4	36	97	13	11	13
L_2M	4	30	96	8	11	6
L_3M	4	29	117	7	11	3
		2 years 4 months.				
L_1M	4	32	129	1	13	3
L_2M	4	27	126	10	12	8
L_3M	4	24	151	4	12	6
		3 years 4 months.				
L_1M	4	32	142	1	13	2
L_2M	4	26	137	3	12	4
L_3M	4	26	169	4	12	4
		4 years 4 months.				
L_1M	4	30	146	8	12	1
L_2M	4	23	134	8	11	9
L_3M	4	25	159	14	10	12
		5 years 4 months.				
L_1M	3	12	140	10	11	14
L_2M	3	19	134	11	11	8
L_3M	3	8	162	8	10	2

The figures speak convincingly enough for themselves, but a few remarks on the outstanding differences seem fitting. These are seen in the material gain in body weight of the Border Leicester cross at practically all ages, while at the same time their yield of wool is surprisingly good, despite the fact that the Border Leicester rams used in the trials were themselves even lighter in body weight than those of the Lincoln, as reference to an earlier table will show.

At 1 year 4 months old, the Border Leicester has an advantage of 19$\frac{3}{4}$ lb. in body weight over the Lincoln cross, and is only 10 oz. behind in weight of fleece.

At 2 years 4 months the difference has been more than maintained, a gain of 22 lb 3 oz. in the body weight being in evidence in favour of the Border Leicester, while the Lincoln has only 13 oz. to the good in respect of fleece.

At 3 years 4 months the difference is most pronounced, and it appears as though at this stage the Border Leicester cross has reached its maximum. The figures reveal its superiority in body weight to the extent of 27 lb. 3 oz. over the Lincoln, while 14 oz. is still shown in favour of the Lincoln in fleece.

At 4 years 4 months the Lincoln cross has apparently commenced to reduce the lead, for only 13 lb. 6 oz. separate the two crosses in body weight, while the Lincoln has further increased its lead in weight of wool to a difference of 1 lb. 5 oz.

At 5 years 5 months the Border Leicester has drawn away again, and 21 lb. 14 oz. separates the two breeds; but a further increase is shown in weight of fleece in the Lincolns' favour to the extent of 1 lb. 12 oz., although it should be noted that at this age the figures only cover returns from three groups of wethers.

Border Leicester–Merino Cross at 2 years 5 months.

Bathurst Experiment Farm.

Comment on the Leicester crosses (L_2M) seems unnecessary. They are conspicuously behind the other two at all ages in body weight, and the difference in their favour in wool as compared with the Border Leicester (L_3M) does not amount in any instance to more than a few ounces.

An item of interest is the age at which the various crosses reach their prime. As previously stated, the greatest body weight is attained by the Border Leicester crosses, and this at the 3 years' stage. The Lincoln crosses, however, show a steady increase in body weight up to 4 years 4 months. The maximum wool weight in the Lincoln is apparently reached at a year younger, while in the Border Leicester crosses no increase in wool weight is recorded after 3 years 4 months. The steady decline between that and the 5 years' stage amounted to over 2 lb.

The results distinctly point to the Lincoln cross retaining its weight of fleece for a longer period; but more convincing proof on that score will be forthcoming from the ewes, their records having been worked out for a longer period.

In order that the differences between the various breeds in respect of these measurements may be seen more clearly, the following table has been compiled:—

TABLE V.—Showing Average Length, Girth, and Waist Measurements (in inches) of Wethers at different ages, Bathurst Experiment Farm.

L_1M.			L_2M.			L_3M		
Length.	Girth.	Waist.	Length.	Girth.	Waist.	Length.	Girth.	Waist.
			1 year 4 months.					
32¾	34¼	37¾	31¾	34¾	38¼	34½	36¾	41¼
			2 years 4 months.					
32¾	38½	42½	34¼	38½	43	36½	42¼	45½
			3 years 4 months.					
32¼	39½	43¼	33¼	39¾	43	34½	43¾	47
			4 years 4 months.					
35¼	41¼	43½	34	40	42¼	35¾	43½	45¼
			5 years 4 months.					
33½	41	42¾	32¾	41¼	42	36	43½	44¾

On comparing these figures, it may readily be seen in what dimensions the Border Leicester asserts its superiority over the other crosses. At the 1 year 4 months' stage they average practically 2 inches longer, 2½ inches greater around the girth, and 3½ inches greater in circumference (so far as waist measurement is an indication) than the Lincoln group. Taken again at the 5 years 4 months' stage, we find that the length is 2½ inches greater, and the girth and waist 2 inches greater than those of the Lincoln. Little difference in these respects is to be noted on comparing the Lincoln with the Leicester crosses.

These differences, however, are only significant of far greater ones to anybody who can appreciate them from the standpoint of conformity. The greater length and roundness of form exemplify a more expansive development of those parts which tend toward an increase in body weight. An outstanding feature of the Border Leicester crosses, when compared with the others, was the heavily fleshed forequarter. The ribs were more widely sprung, and displayed an infinitely better loin. Another conspicuous point was the prominence of the brisket, which clearly revealed the measure in which the sires had impressed their features on their progeny, for all who have studied the Border Leicester know that this is one of its most distinctive features. The general squareness of outline pointed, too, to the flesh being well distributed. This was amply endorsed by the experts, who from time to time examined the carcases. Not only did they comment favourably upon their quality and shape, but in many instances they proclaimed them superior in colour to the rest.

The Combined Returns.

To the particulars thus furnished in respect of the sheep raised at Bathurst, we are now in a position to add the body and fleece weights recorded at Wagga and Cowra since the reports respecting those farms appeared. For the sake of brevity they are now presented in a single table which sets out the weights of the different crosses at the different ages, and at the different farms.

TABLE VI.—Combined Average Weights of Longwool Crossbred Wethers of various ages.

Wethers.		L_1M.			L_2M.			L_3M.		
Farm.	Years Recorded.	No.	Weights.		No.	Weights.		No.	Weights.	
			Body.	Fleece.		Body.	Fleece.		Body.	Fleece.
1 year 5 months.										
			lb. oz.	lb. oz.		lb. oz.	lb. oz.		lb. oz.	lb. oz.
Wagga, 1911–14	4	21	85 14	10 10	27	87 9	10 1	29	99 1	9 11
Cowra, 1912-15	4	28	99 4	9 3	29	98 9	8 5	26	104 11	8 2
Bathurst, 1912-15	4	36	97 13	11 13	30	96 8	11 6	29	117 7	11 3
Averages ...		...	95 5·4	10 10·4	...	94 6·5	9 ·15	...	107 2·5	9 11·6
2 years 5 months.										
Wagga, 1912–15	4	20	119 3	10 15	25	110 13	10 3	26	121 6	10 2
Cowra, 1913-16	4	22	126 5	12 5	16	127 15	10 6	21	140 5	10 10
Bathurst, 1913-16	4	32	129 1	13 3	27	126 10	12 8	24	151 4	12 6
Averages ...		...	125 9·4	12 5·4	...	121 3·5	11 1·1	...	137 1·7	11 1·1
3 years 5 months.										
Wagga, 1913-16	4	17	145 5	14 5	22	134 5	11 7	23	144 3	10 11
Cowra, 1914-17	4	20	134 3	12 15	17	136 13	10 2	19	150 9	10 12
Bathurst, 1914-17	4	32	142 1	13 2	26	137 3	12 4	26	169 4	12 4
Averages ...		...	140 9·8	13 6·1	...	135 5	11 7·3	..	155 9·5	11 5·4
4 years 5 months.										
Wagga, 1914–17	4	17	142 14	10 6	18	133 11	9 13	22	153 14	11 1
Cowra, 1915–18	4	21	143 5	13 12	16	139 3	11 0	16	161 11	11 7
Bathurst, 1915–18	4	30	146 8	12 1	23	134 8	11 9	25	159 14	10 12
Averages ...		...	144 10·1	12 3·2	...	135 9·4	10 14·2	...	158 4·6	11 1
5 years 5 months.										
Wagga, 1915–18	4	17	163 4	12 13	17	151 1	11 8	20	164 9	11 9
Cowra. 1916–18	3	12	146 11	13 0	11	147 0	11 0	9	161 7	10 8
Bathurst, 1916–18	3	12	140 10	11 14	19	134 11	11 8	8	160 8	10 2
Averages ...		...	151 13·0	12 9 8	...	143 8·1	11 3·2	...	163 6·3	11 0·5

In the case of the Lincoln groups of crosses, only three years' returns are available at Wagga, owing to the failure of the ram used in the trials during the 1912 mating.

Reviewed collectively, the Border Leicester again demonstrates its superiority over the other two breeds in respect of body weight, while the Lincoln heads the list in fleece weight at practically all stages.

Taken in order of age, as before, the most material gain is again shown at 3 years 5 months, where the difference in favour of the Border Leicester is practically 15 lb. At 1 year 5 months the average difference in favour of the Border Leicester is 11 lb. 13 oz., at 2 years 5 months 11 lb. 8 oz., at 3 years 5 months 15 lb., at 4 years 5 months 13 lb. 10 oz., and at 5 years 5 months 11 lb. 9 oz., as compared with the Lincoln. The greatest difference in wool is also seen at 3 years 5 months, when the Lincoln crosses have an average advantage of 2 lb. 1 oz. over the Border Leicester. At 1 year 5 months the difference in favour of the Lincoln is practically 1 lb., at 2 years 5 months 1 lb. 4 oz., at 3 years 5 months 2 lb. 1 oz., at 4 years 5 months 1 lb. 2 oz., and at 5 years 5 months 1 lb. 9 oz.

The Leicester again takes third place in respect of body weight, although in two or three instances its crosses have a slight advantage over the Border Leicester crosses in wool weight.

The Rate of Development

In order to show at what age the maximum is reached, I have prepared the following table showing the loss or gain as the sheep developed from year to year:—

TABLE VII.—Showing Gain in Body and Fleece Weights of Wethers from year to year.

Ages.	L_1M.		L_2M.		L_3M.	
	Body.	Fleece.	Body.	Fleece.	Body.	Fleece.
	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
From 1 yr 5 mths To 2 ,, 5 ,,	30 4	1 11	26 13·1	1 2·1	29 15·2	1 5·9
From 2 ,, 5 ,, To 3 ,, 5 ,,	15 0·3	1 0·8	14 1·5	0 6·2	18 8·4	0 4·4
From 3 ,, 5 ,, To 4 ,, 5 ,,	4 0·7	1 2·9*	0 4·4	9 9·5*	2 11·1	0 4·4*
From 4 ,, 5 ,, To 5 ,, 5 ,,	7 2·9	0 3·9*	7 14·7	5 2	5 1·8	0 0·9*

* In these cases losses, not gains, were recorded.

(*To be continued.*)

Maize Pests.

CONTROL OF "CUTWORMS" ATTACKING MAIZE AND CASTOR-OIL SEEDLINGS.

W. B. GURNEY, F.E.S., Assistant Entomologist.

WHEN visiting the Wollongbar Experiment Farm on 6th December, 1918, Mr. A. H. Haywood, the Manager, informed me that "Cutworms" were seriously damaging the stud maize seedlings and also the castor-oil seedlings. On examination, they were found to be the same species of "Cutworm" in both crops, and they were also present in one of the paddocks of maize about a month old. It is an unrecorded pest of these crops, and figures of the caterpillar pupa and adult moth will appear in next month's *Gazette*.

Control measures were carried out, first experimenting with the following four bran and arsenic mixtures to test which would prove most effective before treating the whole of the areas.

(*a*)	Grey commercial arsenic	1 lb.
	Bran	24 lb.
	Salt water (3 oz. salt to 3 quarts water).	
(*b*)	Paris Green	1 lb.
	Bran	20 lb.
	Salt water (as in *a*).	
(*c*)	Paris Green	1 lb.
	Bran	24 lb.
	Salt water (as in *a*).	
(*d*)	Paris Green	1 lb.
	Bran	24 lb.
	Treacle and water (6 oz. to 3 quarts water).	

The (*c*) formula proved most successful on counts made of results after one night's treatment, 79 per cent. of the caterpillars being killed. The remainder of the stud maize crop and the castor-oil seedlings were then at once treated with this bait. The arsenic mixture (*a*) killed only 40 per cent. on the first night.

The usual formula recommended hitherto has been 1 lb. Paris Green to 16 lb. bran, but as the results with the above weaker bait were so successful, a saving of 33 per cent. of the Paris Green needed for such baits would be effected.

The bait is made by mixing the bran and Paris Green together while dry, and then adding the salt water, 1 pint to every 4 lb. bran, which makes a slightly damp crumbly mash. Wet mash is too lumpy and wasteful of material when spreading the bait. With this bait in a sack or kerosene tin slung over the shoulder, a man can walk up and down the rows throwing a small handful at the base of each cluster of two or three seedlings. The salt water keeps the bait moister than when water sweetened with treacle or sugar is used. The bait is best scattered late in the afternoon, and at night the "Cutworms" (*i.e.*, caterpillars) which are sheltering through the day in the soil close to the seedlings, from half an inch to 2 or 3 inches below the surface, crawl up and attack the bait or seedlings. Careful counts were made of various rows, and, after the first night, 40 per cent. up to 79 per cent. of the caterpillars were killed. The next night others would get the bait if it had not become too dry.

Though the bait with 1 lb. Paris Green to 24 lb. bran with salt water killed 79 per cent. of the cutworms, and was used on the remainder of the crop, yet the same bait with treacle and water in lieu of salt water killed practically as well, viz., 77 per cent. of the cutworms; this latter bait is therefore quite effective, though, as stated, it seems to dry more rapidly. The 1 lb. arsenic to 24 lb. bran, in only killing 40 per cent. of the cutworms in the test rows, would seem a decidedly less attractive bait; but strangely, the use of a stronger Paris Green and bran bait, viz., 1 lb. to 20 lb. bran, killed only 40·6 per cent. of the cutworms, which was markedly different from the results with the 1 in 24 Paris Green and bran. Time did not permit of further comparative tests, as immediate treatment was necessary to save the stud maize seedlings.

It is of interest to note that counts of the number of cutworms in different rows of 100 sets of 3 seedlings ranged between 24 and 87 cutworms, usually 1, frequently 2, and sometimes 3 to 7 cutworms to each set of 3 seedlings being present. Percentages of eaten and partly damaged seedlings noted at the time of treatment were 54, 62, 64, 66, and 75, making an average of 64 per cent. of the seedlings damaged by the cutworms.

The material required for one acre of maize would be 2 lb. Paris Green, 48 lb. bran, and 6 oz. salt.

LIST OF PLANTS DECLARED TO BE NOXIOUS IN VARIOUS SHIRES AND MUNICIPALITIES DURING DECEMBER, 1918.

Plant.		Shire.	Municipality.
Scientific Name.	Common Name.		
Lantana camara ...	... Lantana	Warringah.	
Marrubium vulgare ...	... Horehound	....	Yass.
Rubus fruticosus ...	... Blackberry	Warringah.	

Control of Grasshopper (Locust) Swarms.

USE OF ARSENITE OF SODA SPRAY. EFFECTS OF THE SPRAYED GRASS ON SHEEP.

W. B. GURNEY, F.E.S., Assistant Entomologist.

THE grasshopper which appears in swarms every few years in different parts of our inland districts is a rather small brown species (*Chortoicetes terminifera* Walk.), and is similarly destructive in Queensland, Victoria, and South Australia. It generally appears in destructive numbers two seasons in succession, and then for perhaps six to ten years may not reappear in large numbers, though all through this interval it is present in scattered numbers.

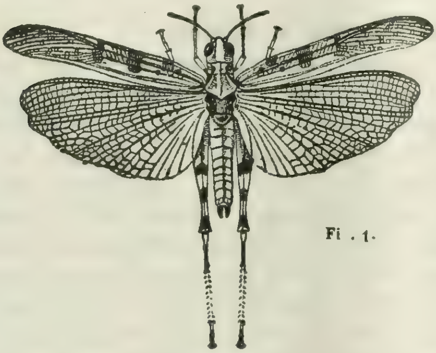
Egg-beds and Number of Broods.

There are two generations each summer, sometimes probably three occur. Normally the over-wintering eggs in the ground hatch in September, though some may hatch during August, and others in October. They grow gradually and are winged in November and through December. They lay eggs in the ground, which hatch in three weeks in midsummer. The second hopper swarms are therefore travelling during December, January, and February, while the second full-grown winged swarms are flying in March and April, and even as late as May. The eggs laid by these last winged swarms remain in the ground unhatched over winter till spring (September). It is when the swarms of winged grasshoppers aggregate on the ground for egg-laying that we have a chance to locate and mark or chart the position of the egg-beds. They do not lay indiscriminately, but a swarm masses together and settles for a day or two on some bare or thinly-grassed area, sometimes along the roadside, and deposit their eggs in the soil, from 1 up to 3 inches below the surface. By noting the position of these egg-bed areas, which vary from a few square yards up to several thousand square yards according to the size of the egg-laying swarm, we are in a position to spray the tiny young hoppers immediately they emerge and before they have grown and spread. By organising and spraying these patches of young hoppers within the first three weeks after emerging from the ground there is little doubt that the majority of hoppers can be killed by spraying before doing any appreciable damage, and the pest can thus be controlled.

Life-history of the Grasshopper.

The female inserts the hind-body (abdomen) into the ground by working the two pairs of short, hard, ovipositor valves at the extremity of the abdomen. Even the hard soil of roadways and tracks may be penetrated, and bores, varying according to the soil from 1 inch to 3 inches in depth, are made, in which the eggs are deposited. As before mentioned, the egg-laying is commonly effected by the swarm in comparatively limited patches of ground, varying from a few square yards up to thousands of square yards, depending upon the size of the swarm. A frothy liquid secretion is exuded with the eggs, below, around and above them, which hardens into an irregular sheath of a spongy and papery nature and protects the eggs somewhat from other insects, and the effects of moisture. The eggs, averaging thirty-six in number, are deposited in transverse rows with the longer axis of the eggs running parallel with the bore, and pointing towards the surface, to which the newly-hatched hoppers immediately make their way. They hatch out in three weeks in summer, but remain unhatched five or six months in the soil over winter.

Immature stages.—The recently-hatched insect is delicate and small (about one-fifth of an inch in length), shaped like the adult insect, but with no trace of wings showing. Six legs are present as in the adult, but at this stage it can leap no more than 2 or 3 inches. It is variously whitish, brown, grey, to almost black in colour.



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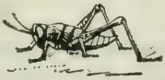


Fig. 2.

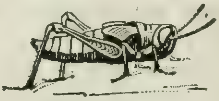


Fig. 3

Fig. 1.—Plague Locust (*Chortoicetes terminifera*).

Fig. 2.—Youngest stage of "hopper" when spraying is most effective.

Fig. 3.—Late stage of "hopper," with wing pads well developed. Stronger spray needed.

As the insect feeds it develops in size by a series of five moults. The period occupied to pass through the immature stages is about seven weeks. The later immature stages are marked by the presence of wing-pads or rudimentary wings on the thorax until at the final moult the wings disappear.

The adult or winged form is the next stage (see Fig. 1), and it is brown in colour, the fore wings marked with darker brown blotches, the hind wings transparent, the tips being marked with a smoky blotch. Once winged the insect never grows larger, and, though variable in size, measures usually about 1¼ inches from the head to the tip of the folded wings. Variation in the size is probably due to the amount and quality of food available during the immature stages. The females are generally larger than the males. The adult lives for a period of several weeks.

As the immature stages occupy a period of about seven weeks, the total length of life from the hatching of the egg to the death of the adult may be three months.

When the adult stage is reached, the insects may move in swarms by crawling or by a series of short flights of a few hundred feet at a time, or by rising higher into the air, pass across miles of country, usually taking the direction of the wind, and avoiding timbered stretches when settling again.

Experiments.

Owing to the severe losses in grass and crops which occurred at Denman, Muswellbrook, and elsewhere in Hunter River Valley during the last three months of 1917, and the second brood swarms from January to April, 1918, the writer marked off some of the egg-beds for future experiment, and collected some of the over-wintering eggs as indicators at the office to know when the hatching occurred in spring. By the 26th September the eggs in the laboratory hatched out and Stock Inspector C. Brooks at Scone notified that the hoppers were hatching there.

I set out to prove whether arsenite of soda spray used at the rate of 1 lb. in 16 gallons water and thereabouts with 3 or 4 lb. treacle would destroy our species of grasshopper, what quantity of material would be needed, what would be the effect on the grass, and finally what would be the effect on sheep fed on the sprayed grass, and to test whether the fears of the pastoralists in using this poisonous spray on his grass were justified. This method had not been tested here though recommended in South Africa.

Success with these experiments at Scone was reported in October last, both as regards killing the hoppers and in demonstrating that at the strengths used the spraying would not kill stock under field conditions. This latter conclusion was based only on severe tests made upon sheep in yards loaned by Messrs Bakewell Bros., Scone, for the experiments.

Spraying and Results.

Field spraying showed that arsenite of soda (with a 57 per cent. arsenious acid content) used at the strength of 1 lb. to 16 gallons water, with 3 lb. of treacle, killed approximately 70 per cent. of the hoppers, and a stronger arsenite of soda, which on analysis showed an 80 per cent. arsenious acid content, killed approximately 75 to 80 per cent. of the hoppers. There was sufficient evidence to show that this stronger arsenite might be used on the younger hoppers at the rate of 1 lb. to 20 gallons water, while using 1 in 16 gallons for older hoppers. This would be a saving on the 1 lb. in 16 and 1 lb. in 12 gallons water usually recommended. Again, the 4 lb. treacle in lieu of 3 lb. treacle would, it was thought, spread and stick better, and prove somewhat more attractive to the hoppers. The extremely heavy winds and the presence of unusually large numbers of insectivorous birds interfered with estimating the effects, particularly of the later spraying tests. The birds, as mentioned later, were a valuable factor, though they are not always to be counted on as a reliable check of the hoppers.

For young hoppers, the spray should be applied to about a 30-feet strip of grass, while for older hoppers a wider strip—up to 50 feet—should be treated. The spray is best applied directly on to the hoppers as well as the surrounding grass.

It should be applied at the rate of 7½ or 8 gallons to the square chain, *i.e.* 75 to 80 gallons per acre. Use enough to moisten, not to drench, the grass.

The spray should be applied in a fine mist, and this is best obtained by a pump working at a pressure of 150 to 200 lb., which is both economical and rapid. On level ground the pump is best mounted on a cart, with one, preferably two, 30-feet hoses attached, each with a nozzle. Smaller pumps may be used, and especially in hilly country the knapsack pumps may prove more practicable.

The caustic action of the spray apparently kills a number of the hoppers which are wetted by the spray, while others are poisoned by feeding on the treated grass. The burning action of the spray causes the blades of grass to brown and die back, but this is only superficial, as the roots are apparently unaffected. On more succulent grass, and on lucerne, the burning of the leaves is more rapid than on harder dry grass, but again the effects are quite temporary, and the scorching is superficial.

The cost of the spray works out at 1d. to 1¼d. per gallon.

Effects of Sprayed Grass on Sheep.

It now became necessary to test the effect of sprayed grass on sheep, and tests were devised which were purposely made drastic. For instance, the President of the Pastures Board at Scone, before which Board I outlined the scheme, considered that if half the grass in sheep yards were sprayed, and the other half left unsprayed, and the sheep fed on this, it would be a severe test as to whether the spray could be used safely in the paddocks or not; I went further, and sprayed the grass of four out of the five yards all over, thus forcing the sheep to feed wholly on the poisoned grass for the week they were enclosed. Again, the grass in all the yards was sprayed at the rate of 90 gallons to the acre, as against the 80 gallons to the acre recommended. Moreover, three or four days would be a severe test as a period to confine the sheep in the yards, but all were kept for seven days in the sprayed yards. Yet, in the one yard in which only half the yard was sprayed, the two sheep fed well on both sprayed and unsprayed grass; there were no casualties, nor were they visibly affected in condition after a week. In one yard where the whole yard was sprayed at rate of 1 lb. to 16 gallons all over, no casualty occurred till the seventh day, when one of the two sheep in this yard was reported by Stock Inspector Brooks to be dead. With yards sprayed all over with white arsenic, 1 lb. boiled with 2 lb. washing soda to 16 gallons water, no casualties occurred, though the sheep showed symptoms of scouring; while similarly in the yard sprayed with 1 lb. white arsenic with 2 lb. washing soda diluted in only 12 gallons water, no casualty occurred, only signs of scouring. In one yard sprayed with arsenite of soda at strength of 1 lb. to 12 gallons water, one of the sheep died on the third day, but the other sheep only showed signs of scouring. Thus we see that of six sheep on grass sprayed with the strength of 1 lb. arsenite to 16 gallons water, in three separate yards, no deaths occurred till the seventh day. This was an excessive test, and might really be looked upon as indicating that eventually sheep would die if forced to feed continuously on poisoned grass. And of four sheep, in two separate yards on grass sprayed at the stronger strength, *i.e.*, 1 lb. arsenite to 12 gallons water, three survived the test for a week, one only died on the third day.

These results are eminently satisfactory because, while ranging over the paddocks the most of the sprayed grass which any sheep in the field is likely to get is an hour or two's feeding, generally probably only a few mouthfuls, if any, of the poisoned grass, and not a week's forced feeding as our test provided. It is to be remembered that, in practice, only one or two acres in a hundred acres would be sprayed, as the egg-beds of the locusts are quite limited and widely scattered over the countryside. Therefore, while it is not contended that if stock are fed continuously on poisoned grass serious results are not likely to occur, yet three or four days on it may be considered a severe test, and anything over—say six or seven days—may be looked upon as a very severe test, and in practice never likely to occur.

Again, it is thought that sheep feeding on grass just sprayed are likely to get a severer dose of arsenic than those feeding half to over a day later; yet in practice it is well to realise that stock might get on to grass sprayed perhaps only a few hours previously. The tests, therefore, included the placing of the ten sheep experimented on into the sprayed yards—2 hours, 3¼ hours, 3½ hours, 5 hours, and 6¼ hours after spraying the grass—so that the danger of stock reaching recently-sprayed grass was catered for in the tests and, as stated, they were as satisfactory in assuring safety under practical field conditions as one could expect with the use of such material. Full data of the size of the five yards used in the experiments, strength of spray used, rate applied, period of each test, and results are given later.

It is worthy of note that these swarms of October were the tail end of the visitation of the locust swarms of 1917 and early 1918 of the Denman, Merriwa, and Muswellbrook areas which this season are free, the winged swarms having passed on beyond Aberdeen to Scone, Segenhoe, Gundy, &c., while some appeared at Ravensworth. I am of opinion that two factors have played a great part in checking them about Scone and Segenhoe, viz., the large number of starlings and particularly of the wood swallows (*Artamus superciliosus*), feeding on the hoppers. The starlings were observed in swarms of several hundreds at a time, and the wood swallows in swarms three or four thousand strong, and stomachs examined by me revealed, as in past years, the presence of the hoppers. A second factor may have been that the later-hatching young hoppers, which require something soft and tender, found no green or succulent grass on the scorched areas, and probably many succumbed. However, these are not factors always to be expected, and the value and necessity of applying the results of these experiments, by organising the different districts for future outbreaks is necessary.

DETAILS OF TESTS IN BAKEWELL BROS.' SHEEP YARDS, AT SCONE, OF THE EFFECT ON SHEEP OF GRASS SPRAYED WITH ARSENITE OF SODA WASH, AS USED FOR GRASSHOPPERS.

Six sheep were purchased by the Department and six sheep were provided by Mr. H. L. White, of Belltrees. They were all old wethers, but in normal condition. One of each lot of six sheep were retained in an unsprayed sheep yard as controls in the experiments. The remaining ten sheep were distributed in twos in each of five yards sprayed with different strengths of arsenite of soda, treacle, and water, and left to feed on the sprayed grass for a week in each case.

No. 1 yard.—The yard was sprayed all over with the strength of 1 lb. arsenite of soda and 3 lb. treacle to 16 gallons of water by 10.30 a.m. on the morning of Friday, 18th October, 1918. The rate at which spray was applied was at 90 gallons to the acre. At 4.45 p.m. of the same day two sheep (branded 4) were put into the yard, *i.e.*, less than six and a half hours after spraying. These sheep fed apparently indiscriminately over the yard, and passed fæces freely throughout most of the following week. On the third or fourth day they were to have been moved, but were retained in the yard till 10.30 a.m of Monday, 28th October, (nine days). But one sheep died on Friday, 25th (seventh day), the other went the extra two days and was perhaps slightly scoured. The stomach contents of the sheep that died were removed and sent for analysis by the Chemist's Branch of the Department. They reported that absolutely no arsenic was detected. This may mean that either the arsenic had been absorbed, or that the sheep died from other causes.

No. 2 yard.—Sprayed but not used in the experiment.

No. 3 yard; area, 2,244 square feet.—Half the yard sprayed with 1 lb. arsenite of soda and 3 lb. treacle to 16 gallons water at the rate of 90 gallons to the acre, at 11 a.m. on 18th October, 1918; the other half was left unsprayed. At 4 p.m. the same day, *i.e.*, five hours later, two sheep (branded 2) were put in and left for eight days. Both sheep survived well.

No. 4 yard; area, 3,200 square feet.—Whole yard sprayed with 1 lb. arsenite of soda and 3 lb. treacle to 12 gallons water, applied at rate of 90 gallons to the acre, on 21st October, 1918, at 1 p.m. At 4.15 p.m., *i.e.*, three and a quarter hours later, two sheep (branded 7) were put in this yard. On the third day Mr. Brooks wired that one sheep was dead while the other was badly scoured. The remaining sheep survived, and was removed on the seventh day, viz., 11.30 a.m., 28th October, 1918.

No. 5 yard; area, 1,071 square feet.—Whole yard sprayed with arsenite of soda made by boiling 1 lb. white arsenic with 2 lb. washing soda and diluted to 12 gallons water, applied at the rate of 90 gallons to the acre. Sprayed by 1 p.m. on 21st October, 1918, and at 4.30 p.m., three and a half hours later, two sheep (branded 6) were put in. No deaths occurred. Sheep removed after seven days. Symptoms of scouring noted by Inspector Brooks on 24th October, 1918.

No 6 yard; area, 1,600 square feet.—Whole yard sprayed with arsenite of soda made by boiling 1 lb. white arsenic with 2 lb. washing soda diluted with 16 gallons water, at 3.15 p.m. on 21st October, 1918, at the rate of 90 gallons to the acre. At 5.15 p.m. two sheep (branded 8) were put in. No deaths occurred. Sheep removed seven days later. Symptoms of scouring were reported by Mr. Brooks on 24th October, 1918.

Spray Formulæ.

From the foregoing data the following formulæ can be recommended :—

For youngest Hoppers—up to three weeks old.

(*a*)	Arsenite of soda (80 per cent. arsenious acid)...	1 lb.
	Water	20 gals.
	Treacle	4 lb.

or

(*b*)	Arsenic	1 lb.
	Washing soda	2 lb.
	(1 lb. will dissolve the arsenic, and even less soda may be used if carefully done.)	
	Water	16 gals.
	Treacle	4 lb.

or

(*c*)	Arsenite of soda or Arsenated soda (with 60 per cent. or less arsenious acid content.)	1 lb.
	Water	16 gals.
	Treacle	4 lb.

For Hoppers over three weeks old.

Dilute (*a*) with only 16 gallons water ; (*b*) with 12 gallons water, and (*c*) with 12 gallons water.

It is noteworthy that in the particular tests carried out, the arsenic and washing soda mixture (*b*) seemed to have less effect on the sheep than the arsenite mixture (*a*).

Scheme of Control.

It is apparent with a remedy to hand that with organisation among the pastoralists they may control this pest. The Pastures Protection Boards or other committees of each district could arrange a system by which each centre had several spray pumps ready in working order, and also supplies of the spray materials in stock. The individual pastoralist or farmer should at once notify his Board or Committee of the appearance of grasshopper swarms, particularly winged swarms when egg-laying, and the egg-beds should be carefully noted ; fortunately they are comparatively limited in both number and area. Then in the spring or midsummer hatching, but preferably the September or spring hatching, men and spray pumps should be sent out and the spraying done within the first three weeks of hatching, before the hoppers have spread far from the egg-beds or have become scattered.

It is difficult to estimate, but it is considered that an average of only about 1 acre in 500 acres would be likely to have egg-beds, and thus would need spraying. Adjacent unaffected districts could send their pumps to the affected areas, as it essentially concerns all, for later on the winged swarms pass readily for miles into adjacent districts. Universal action is therefore necessary for success.

The cost of the material, about 1d. or 1¼d. per gallon, is not prohibitive ; labour is the biggest item, but the cost, even if it runs into hundreds of pounds, is to be looked upon as an outlay distributed among those concerned in many districts, and becomes quite a nominal amount compared with the saving of thousands of pounds in grass and crops which even a mild outbreak of grasshoppers may otherwise destroy. Again, the expense is not a continuous annual one, but may only be necessary for one or two seasons out of many seasons in any one district.

Failing the voluntary co-operation of pastoralists and farmers, it would appear that compulsory spraying is the only other means of rapidly and effectively controlling this pest.

The use of arsenite of soda washes, as above described, does not preclude the use of other methods of control being employed in local cases to protect particular crops or paddocks, provided they are efficient. The spraying of the outer edge of a crop with other arsenic sprays, or the use of a mixture of horse manure, arsenic, and treacle mixed as a mash and scattered along the edge of crops, will destroy the hoppers of a swarm advancing on to a crop before they have done much damage. Also, where safe, burning over the egg-beds where young hoppers are massed, or places where swarms are densely congregated, and the use of flares or torches swept over where hoppers are dense will destroy thousands of the insects. Oil and soap sprays will destroy hoppers also, but are too costly for extensive use. The advantage still remains with the arsenite of soda spray, for besides killing partly by caustic action, it poisons the hoppers for days afterwards, as they must feed on the adjacent poisoned grass; and even hoppers unhatched when the egg-beds are sprayed emerge only to find poisoned grass to feed on.

Thanks are due to Mr. C. Brooks, Stock Inspector, Scone, for co-operation and practical help and advice throughout the whole of the experiments; his knowledge of the stock and local conditions was of great help. The Department is also particularly indebted to Messrs. Bakewell Bros., Scone, who allowed field experiments on the hoppers in one of their paddocks, and also handed over their sheep yards for the tests on the sheep, and supplied us with material and assistance.

RAPE AS SHEEP FEED.

AMONGST those who have proved the value of rape as a feature of the wheat and sheep farm, and who have esteemed the results so good as to justify them in increasing the area from year to year, are Messrs. Gillespie Brothers, of "Yarrandale," in the Gilgandra district. It was in pursuance of the Department's recommendation that their manager, Mr. R. Griffiths, adopted rape as part of the farm practice several years ago, and they are now firmly convinced of its utility.

In 1916, a good season, 5,000 sheep were fattened on rape, and in 1917 a fair growth was obtained despite a dry autumn; unfortunately, aphis attacked the crop and did so much damage that only 600 sheep could be fattened.

In February, March, and April of 1918, 380 acres of land ploughed in the previous August were sown with rape at 3 lb. seed per acre. A light rain in April germinated the seed, but on two occasions during the winter rain came only just in time. The growth following 3 inches of rain on 19th July was remarkable, and in four weeks 1,500 wethers were turned in, and later 1,800 more. These were aged Queensland wethers that had had a bad time in June and July, but they fattened off rapidly, and 3,040 were trucked in September and October. Had rain fallen in September the number of sheep could have been doubled—for twenty sheep per acre have been fattened on rape at "Yarrandale" in previous years.

Portion of the 380 acres had not been fallowed, and carried very little fodder—one more demonstration of the value of fallowing. The rest of the crop, too, would doubtless have been better had the fallow been surface-worked in, say, December or January, before sowing.

Mr. Griffiths' method is to give sheep access to stubble or grass while they are on rape, so that there may be no danger of hoven. He finds that when sown in April, and favoured with autumn rains, rape is ready for feeding off in June, and in normal seasons keeps growing till the end of September.

The Department has recommended this crop to farmers for years past, not only because of its value as a fodder, but because it is also a great soil-renovator, drawing its plant food from the deeper sources of fertility, opening up the subsoil in doing so, and increasing the humus content when the plant and animal residues are ploughed in. In this way it contributes to the wheat crop for the following two or three seasons; but such cases as that mentioned above prove it to have a substantial and direct value as a profit-earning venture.

Plans of a Bacon Factory.

L. T. MacINNES, Dairy Expert, and C. PEDERSEN, Dairy Instructor.

The development of the dairying industry in this State has created a corresponding increase in the raising of pigs, and consequently in the production of pork, hams, and bacon. It is interesting to note that in the year 1901 we had 265,730 pigs in this State, and manufactured 11,080,891 lb. of bacon and hams. For the year 1916–17 the number of pigs had increased to 359,763, and 15,788,156 lb. of bacon and hams were produced. We may assume that the producer in that year received about £500,000 for his pigs.

To date the export of bacon, frozen pork, and lard has not reached large dimensions. In 1901 there was exported £10,424 worth of bacon and hams, but, during the same time, we imported £29,516 worth. In 1916 the value of the exports of bacon and hams exceeded that of the imports by £14,635; while the frozen pork imported amounted to £32,249, that exported was hardly worth taking into account, thus showing that we are able to consume more than what we produce.

Some years ago a considerable amount of bacon was made on the farms, not only for the farmers' own consumption but also for sale. Home curing has been greatly reduced since co-operative bacon factories have been established, and we may take it for granted that co-operative dairy companies will in the future erect bacon factories in conjunction with the butter factories as soon as the production of pigs in their respective districts warrants it. Recently, in connection with the finishing of the green bacon for the market, there has come about a change in procedure. Now the manufacturers despatch the majority of their bacon to Sydney to be smoked and dressed. The distributing houses are in a position to have this work carried out, and thus relieve the manufacturer of a big portion of his work. This will be a great benefit, and should assist in the establishment of many small factories in different parts of the State, and will at the same time put on the market an article of uniform appearance. In anticipation of an increase in bacon manufacture, and also to comply with the demand which has already set in by companies contemplating the erection of bacon factories, the Department arranged to have these plans prepared.

In laying out the general plan one of the principal matters kept in view was to enable the work to be carried out as economically as possible by allowing the articles to be cured to go through the different processes with the least possible handling.

In the curing room it is necessary to have a fairly low and even temperature; the floor should be well insulated under the concrete so as to prevent any leakage of cold. The question of erecting the curing and chilling rooms with a space between the insulated walls and the main wall of the building is worthy of consideration, particularly in warm districts, as owing to the increased cost in fuel and labour refrigeration becomes more and more costly, hence the necessity for getting the insulation as perfect as possible.

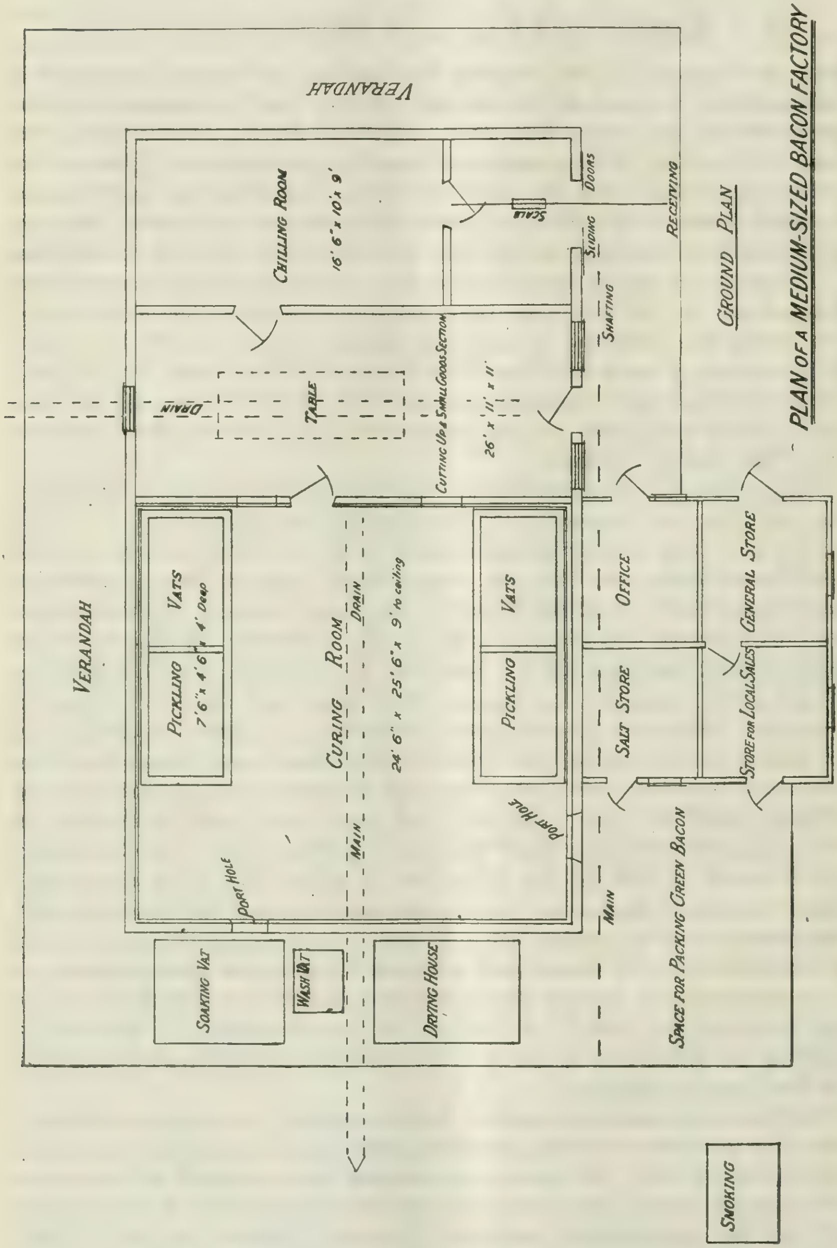

PLAN OF A MEDIUM-SIZED BACON FACTORY
GROUND PLAN
VERANDAH
CHILLING ROOM
16'6" x 10' x 9'
DOORS
SCALE
RECEIVING
SLIDING
SHAFTING
DRAIN
TABLE
CUTTING UP & SMALL GOODS SECTION
26' x 11' x 11'
PICKLING VATS
7'6" x 4'6" x 4' Deep
CURING ROOM
24'6" x 25'6" x 9' to ceiling
DRAIN
MAIN
PICKLING VATS
PORT HOLE
PORT HOLE
VERANDAH
OFFICE
GENERAL STORE
SALT STORE
STORE FOR LOCAL SALES
MAIN
SPACE FOR PACKING GREEN BACON
SOAKING VAT
WASH VAT
DRYING HOUSE
SMOKING

Fig. 1.

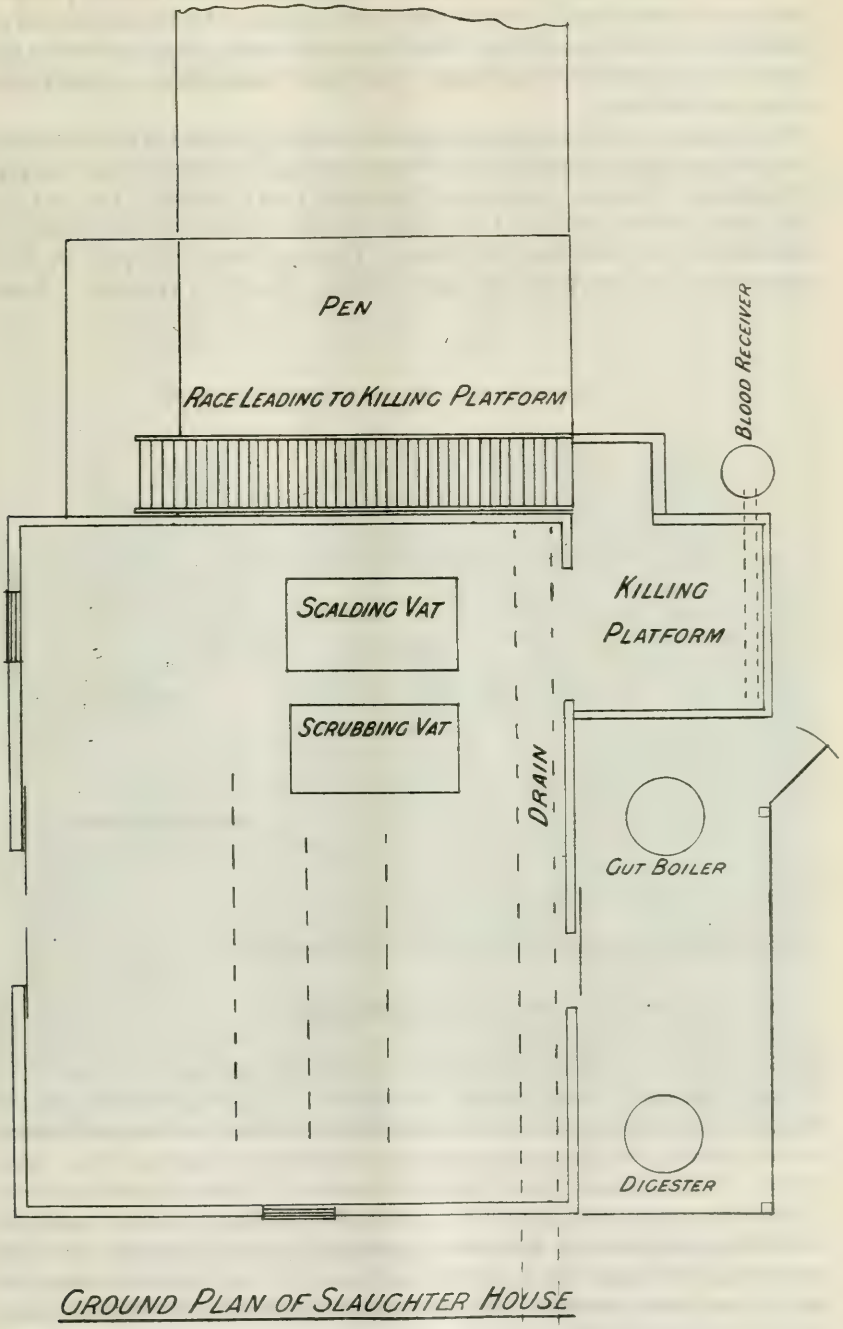

PEN
RACE LEADING TO KILLING PLATFORM
BLOOD RECEIVER
SCALDING VAT
KILLING PLATFORM
SCRUBBING VAT
DRAIN
GUT BOILER
DIGESTER
GROUND PLAN OF SLAUGHTER HOUSE

Fig. 2.

A bacon factory may be erected and attached to a butter factory provided there is no direct access between the two sections. By having the bacon department in proximity to the butter factory the same set of machinery and boilers would serve both sections. This would mean a big saving in the outlay on machinery.

The slaughter-house and pig pens must, however, be situated a considerable distance from the butter factory. Where less than twenty-five pigs are kept the minimum distance, as provided for in the Dairy Industry Act, 1915, is 200 yards. If the number of pigs kept exceeds twenty-five, this distance is increased to not less than 300 yards. The pens where the pigs are kept should have concrete floors and good drainage should be provided. Water should be laid on to allow of hosing down both the pigs and the floors—it is necessary that they should be kept very clean. The slaughter-house should also have concrete floors and good drainage. The killing platform should have a concrete floor, and the walls should be impervious to moisture for at least 4 feet. For this, cement plastering is recommended to allow of washing down.

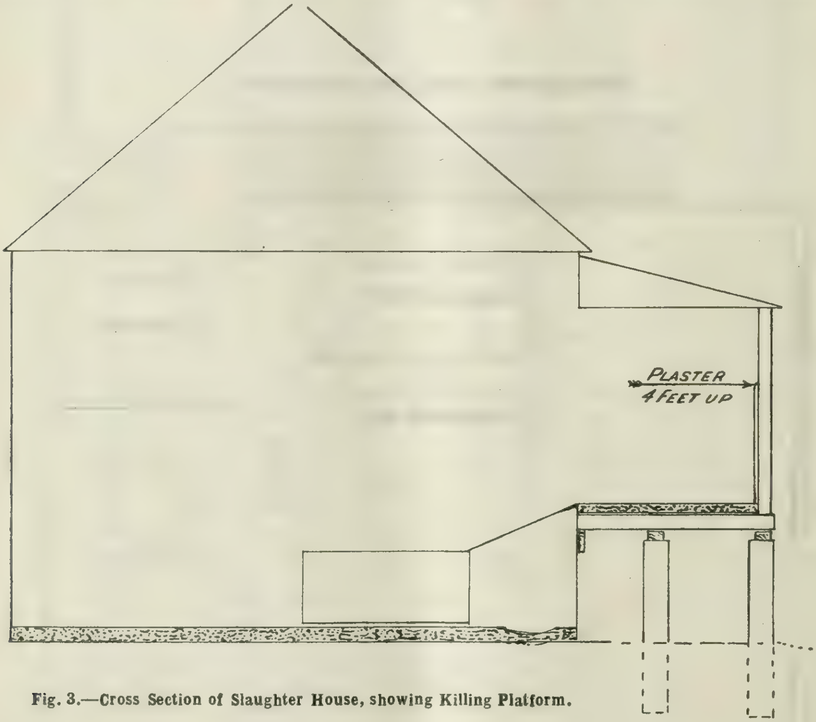


Fig. 3.—Cross Section of Slaughter House, showing Killing Platform.

The Department is prepared to give those proposing to enter upon the manufacture of bacon, or those who contemplate making alterations in their premises, all the information at its disposal, and to give advice in regard to building and other matters. Copies of plans will be sent out when desired, and, if necessary, an officer can be sent to inspect the site selected.

Animal Aids to the Spread of Prickly Pear.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist.

WHEN prickly pear plants once become well established they produce an enormous number of fruits, each containing a large number of seeds. The seeds are surrounded by a dark purple pulp, which is not at all unpleasant to eat, having a sub-acid flavour, and great thirst-quenching qualities. The emu and the black magpie eat quantities of the fruit, and the hard-coated seeds passing uninjured through their intestines are scattered by them over wide areas. Fortunately the seeds of prickly pear do not germinate and produce young plants readily; but where all the conditions have been favourable, one frequently finds little clumps of seedlings. Illustration 1 shows the fæces of an emu containing numerous prickly pear seeds. Illustration 2 shows a

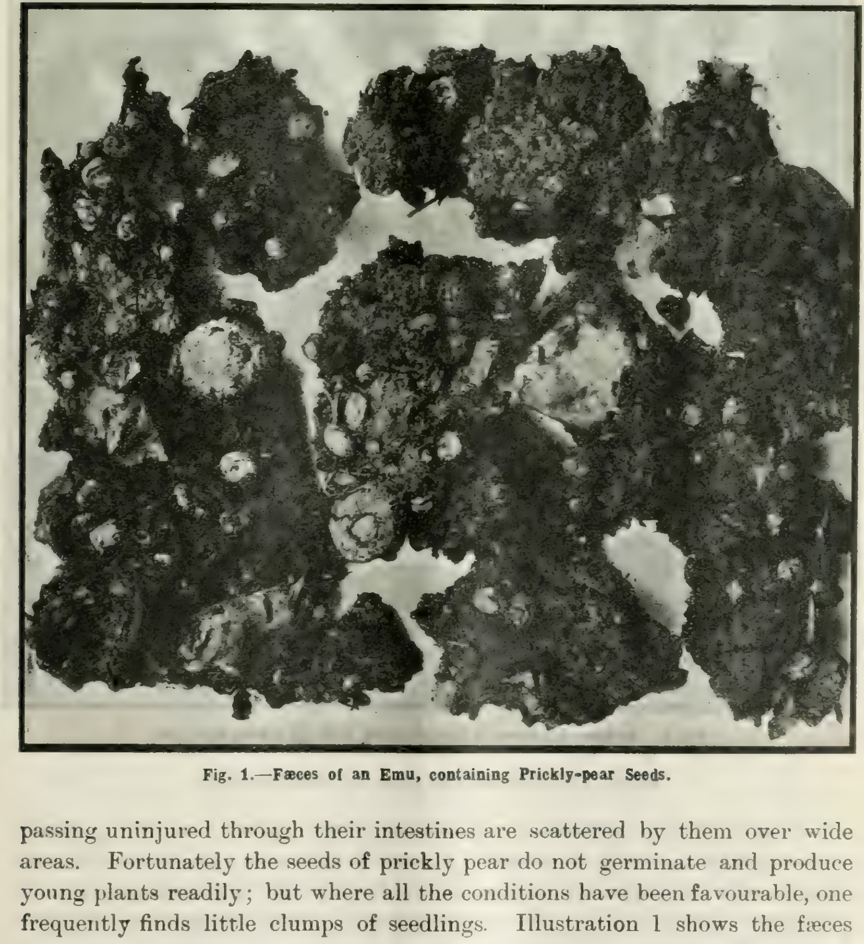


Fig. 1.—Fæces of an Emu, containing Prickly-pear Seeds.

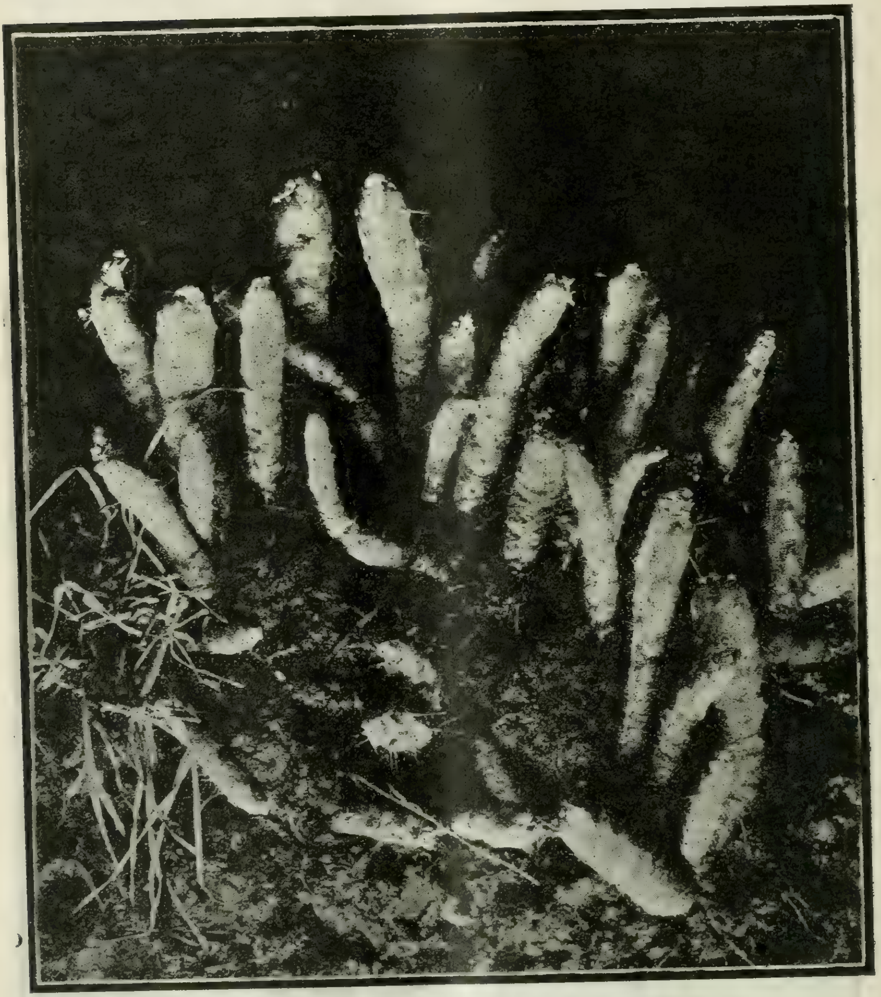


Fig. 2.—Seedling Prickly-pear Plants arising from the Fæces of an Emu.

ANIMAL AIDS TO THE SPREAD OF PRICKLY PEAR.

number of prickly pear seedlings arising from the fæces of an emu that had fed upon prickly pear fruit. The cylindrical stems of the seedlings are well shown; it is only as the plant ages that the flattened segments make their appearance.

These specimens were forwarded by Mr. A. C. M. Lockhart, District Land Surveyor of Moree. They serve to illustrate the manner in which prickly pear may be spread by emus, and the necessity for keeping these birds out of pear-infested country.

The black magpies are very fond of the prickly-pear fruit, and doubtless the scattered clumps of prickly pear, so often found at the foot of trees in country otherwise uninfested are largely due to these birds. A warning may be given here; it has been given before, but cannot be repeated too often:

These scattered prickly-pear clumps should be destroyed as soon as noticed; they can be easily dealt with, but if allowed to remain the prickly pear becomes unmanageable. The experience related by many is that at first there were a few prickly pear plants about, and little notice was taken of them. At the end of five years or so, they became a bit thicker; and then seemingly all at once the prickly pear took possession of the land, and the problem of dealing with it appeared hopeless.

Rabbits are fond of prickly-pear fruit, and when it is ripe any rabbits shot in the neighbourhood of pear-infested country will be found to have the fur just above the front legs stained with the juice of the fruit on which they have been feeding. Usually the seeds are bitten into small pieces by the rabbit, but occasionally whole seeds may be found in the fæces.

Cattle will eat prickly pear fruit, and large quantities of the seed, some of which has been proved to be capable of germinating, have been found in their droppings. If allowed to go upon pear-infested country at the time the fruit is ripening they may aid considerably in disseminating the pest.

Production of Red Clover Seed.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

In an article on Red Clover, published in the *Agricultural Gazette* for February, 1918, attention was drawn to the heavy setting of seed at both Yanco and Glen Innes Experiment Farms. Since that time further additional information has been received on this point. Mr. R. N. Makin, Inspector of Agriculture, reports:—"At Mittagong, on the Boys' Farm Home, I found that seed had set freely, and had well matured. At Milton, on Mr. L. Kendall's farm, the plants have grown strongly; several cuts have been taken off, and now the plants are seeding well, the seed being good. At Gerringong, on Mr. C. T. Hindmarsh's farm, I found heads carrying good sound seed."

In December, 1918, he reported :—"The past winter and spring proved very dry, and the growth of the clover was not as good as in the former season. Still, it did as well as could be expected, and in several cases grew so well that further plantings have been made by the farmers. At Kembla Grange Red Clover grew well, where lucerne, sown at the same time, died out. As to the seeding habit of the plants, the stands have thickened as a result of the previous seeding, and in spite of the bad season the seed heads have been noticed to be full of good plump seed even as late as this month, when an inspection was made at Kembla Grange."

At Yanco Experiment Farm, a remarkably heavy crop of seed was again harvested in December, 1918, from a small plot of Red Clover, and at Hawkesbury Agricultural College, in spite of the dry season, seed was set in abundance.

Since the bumble bee is absent in New South Wales, the evidence is now complete and unmistakable that fertilisation is effected by some other agency. The latest researches in this connection have been undertaken by Westgate, the American Agronomist, who, in summarising his results, states :—

(1) That germination of the pollen grains takes place only within a limited range of variation in the water supply. (This would mean that a very wet season would seriously retard the fertilisation of the flowers.—E.B.)

(2) That self-pollination in Red Clover is practically nil.

(3) That bumble bees are able to pollinate from thirty to thirty-five flowers a minute.

(4) *That the honey bee proved to be as efficient a cross-pollinator of Red Clover as the bumble bee in one year when the rainfall was below normal.*

It is the last conclusion that is particularly important as regards Australian conditions. Mr. W. W. Froggatt, Government Entomologist, reports that we have many indigenous long-tongued bees in Australia, capable of reaching the pollen of the flowers. It is very satisfactory to know this, although up to the present I have not noticed any such bees visiting the flowers, and observations have been very frequent. Honey bees, however, at all the Experiment Farms, visit the plots constantly, and undoubtedly carry pollen from flower to flower. Our summers are seldom particularly wet, and the pollen grains are little injured. It can now be safely assumed that the production of Red Clover seed in this State can be effected without the presence of the bumble bee.

A Vine-destroying Longicorn Beetle.

(*Monohammus* sp.)

WALTER W. FROGGATT, F.L.S., Government Entomologist.

In consequence of a report that a borer was doing a great deal of damage among the vines on the Hunter River district, the writer visited the infested areas in the early part of November, and collected specimens of the damaged vines containing the borers in all stages of development. No perfect beetles were obtained in the vineyards, but both well developed larvæ and pupæ were found, and from two of the latter, the perfect beetles emerged in the first week of December. It is therefore probable that the life cycle of this destructive beetle takes about a year, the eggs which have just been deposited on their food plant being due to come forth as perfect beetles next December.

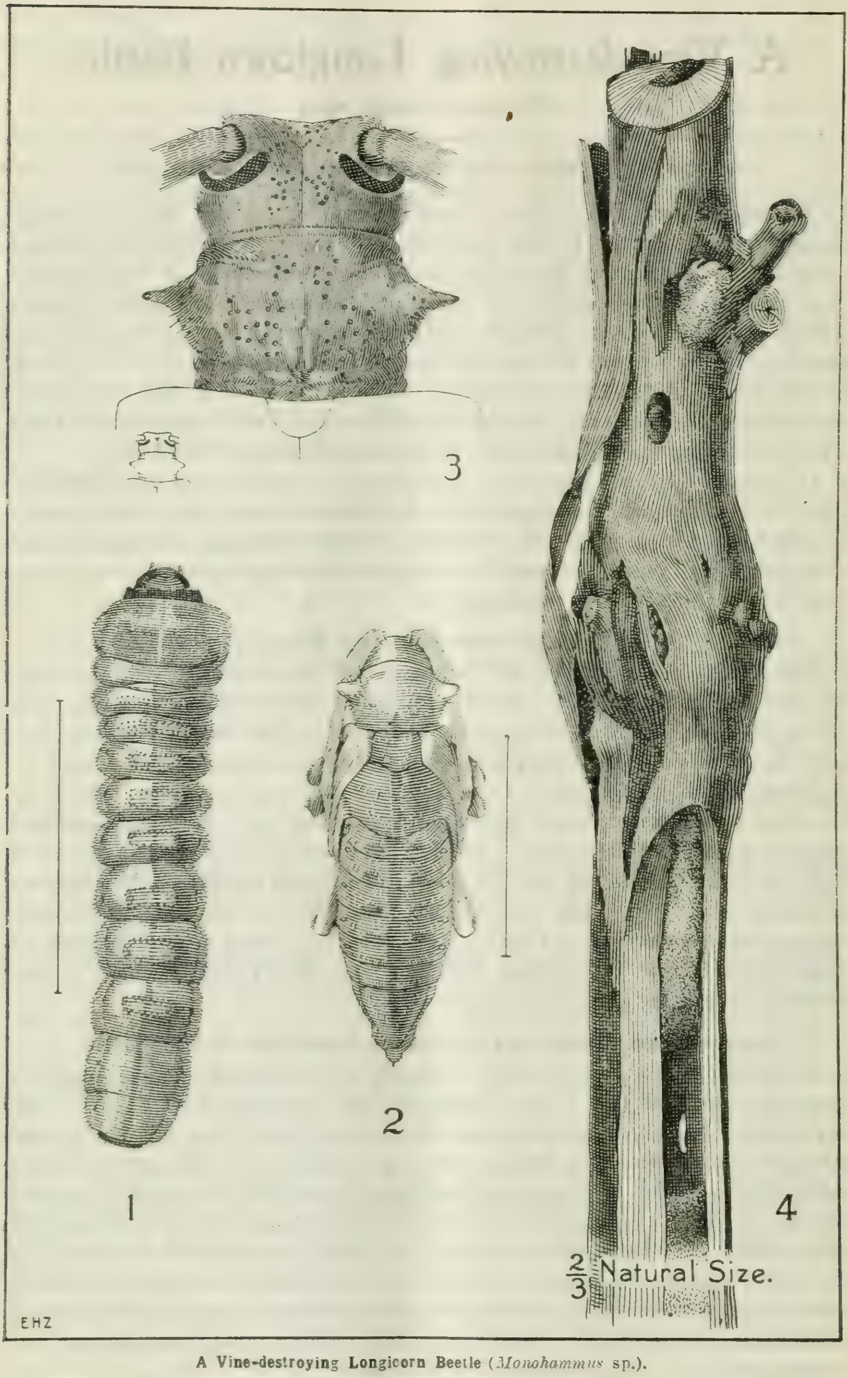
In dealing with such a pest it is important to know when the female is likely to be depositing her eggs, for at that season precautions can be taken to look for and destroy the active beetles, or to treat the stem and canes of the vines with some mixture that will be distasteful to the beetles, and stop them from laying their eggs on the stems.

Damage caused to the Vines.

The beetles apparently deposit their eggs on the outer surface of the bark on the main stem, 4 or 5 inches above the surface of the ground, while the larva sometimes feeds along under the bark up one side of the stem, but more frequently it bores straight up the centre, for a distance of a foot or eighteen inches. The action of the feeding larvæ can be easily traced by the frass and gnawed wood mixed with exuding gum, forming cemented lumps along the infested stem. The larvæ pupate in any part of the stem just under the bark in the end of a burrow. In some sections of the vineyard probably from 5 to 10 per cent. of the vines had been damaged. A sharp-sighted man, however, could with a little practice destroy a large number of these beetle larvæ by cutting them out, or simply killing them in the burrows, with very little injury to the vines.

Native Food Plant and Origin of Infection of the Vines.

In the immediate vicinity of the infested vineyards the writer found no growing trees that could have harboured the Longicorn beetles, but some soft-wooded tree, such as a fig, might have been blown down or cut up, and while drying attracted the beetles, the eggs deposited by them producing the adult beetles, which on emergence, finding no other timber suitable, infested the grape vines. We have had many instances of such local infestation with other allied wood-boring beetle larvæ. If this is the origin of the attack on the vines—plants which do not appear to be a suitable food for the larvæ of such a large Longicorn—it is reasonable to expect that it may be quite a casual infestation, which will run itself out without doing much more damage this coming season.



A Vine-destroying Longicorn Beetle (*Monohammus* sp.).

1. Larva. 2. Pupa. 3. Showing the markings on head and prothorax. 4. Stem of vine, showing damage caused by the beetle larvæ.

Life History of the Beetle.

The full-grown larva is about $1\frac{3}{4}$ inches in length ; the head and thorax are thickset, with the more slender rounded abdominal segments constricted, the last two fitting close together and rounded at the tip ; each of these segments, with the exception of the two terminal ones, with a finely crenulated oval area on the upper and under surface, with a shallow central dorsal stripe on both the upper and lower surface. The general colour is dull white, head like that of *Monohammus fistulator* (illustrated in the January issue of the *Gazette*), but the basal portion of the pro-thorax is more finely granulated with reddish brown, and smooth dark blotches on the sides.

The pupa is exactly like that of the passion-vine borer in form and coloration, and is usually found resting in the upper end of the bore. The beetle is closely allied to the passion-vine borer, and may turn out to be only a variety of that species, but the pattern of the punctures on the head and sides of the thorax are different, the thoracic spines are more rounded, and the larva differs in the markings on the dorsal surface of the abdominal segments.

Remedies and Suggestions.

Beyond what has been previously noted there does not seem to be much that can be done to destroy these Longicorn beetles, but a careful inspection of all the vines in infected areas would enable the owner to note any suspicious spots on the vine stems, and with an awl or sharp knife such places may be probed, and the hidden larvæ killed before the damage threatens the life of the vine.

"SHEEP MAGGOT FLIES, NO. 4."

UNDER this title a report of the work carried out in the North-west during 1917–18 at the Government Sheep-fly Experiment Station at Kooroogama, Moree, by Messrs. W. W. Froggatt, F.L.S., Government Entomologist, and J. L. Froggatt, B.Sc., Officer-in-charge of the Station, has just been published by the Department as Farmers' Bulletin, No. 122.

The report is prefaced by a note from Mr. J. Kidd, President of the Pastoral Committee for the Investigation of the Blow-fly Pest, and contains a valuable summary of the recommendations and results to date.

Copies of the Bulletin may be obtained, by persons interested, free on application to the Under Secretary and Director, Department of Agriculture, Sydney.

VINEYARD NOTES FOR FEBRUARY.

MOST varieties will be rapidly coming to maturity this month and many will be ripe enough for cutting.

Unfortunately, the dry conditions, more particularly in the wine areas, have checked the growth and development of the fruit to a certain extent. Where rains have fallen in the form of thunderstorms, the vines will benefit considerably and the most should be made of this moisture by stirring the soil to break up the surface crust. These same rains will also, in many cases, allow of some of the backward cultivation to be made up. Wherever it is possible to do so, the development of table grapes should be assisted by irrigations. Unfortunately, in some instances under notice the vines have been allowed to suffer from the want of moisture owing to the fear of developing Downy Mildew or Black Spot. This is to be regretted, as there is little danger of starting these diseases by applying water to the soil under dry atmospheric conditions. As it is the fruit promises to be small and the bunches not too well filled.

In the case of Oïdium, which is seen as a greyish-white mould upon fruit, leaves and canes, atmospheric conditions, in spite of the drought, have been favourable to its growth, and this disease has been very prevalent in some localities. Apart from its appearance, the affected parts have a characteristic mouldy smell. Constant sulphuring has been necessary, but where properly dealt with the disease has been held in check. Wherever it is noticed the vines and fruit should be well dusted with fine sulphur. In some few instances a little Black Spot has been noted, but so far no authentic case of Downy Mildew has been recorded this season. In several instances, other diseases and disorders have been attributed to Downy Mildew. One of the chief of these is Erinose, a diseased condition caused by a Vine Mite. This animal organism burrows into the tissue of the leaf and develops blisters or galls on the upper surface; the depressed under surface of these galls is covered with a development of fibres, which, to anyone unfamiliar with Downy Mildew, might lead to error in identification. Downy Mildew does not create blisters and does not turn brown as does the Erinose. In any case the latter does but little actual harm to the vines.

Another cause for suspicion in several instances was due to the vines suffering from lack of moisture and developing yellowish spots upon the leaves not unlike the first indications of Downy Mildew. It will be noted that it is the oldest leaves near the base of the vine which are first affected. This is simply following out the natural tendency of plants to shed a portion of their foliage in order to minimise evaporation, and the development of the yellow spots is the first stage. *Under wet conditions these spots might well indicate Downy Mildew.* Vines which exhibit these signs accompanied by small and starved fruit, should be watered if possible.—H. E. LAFFER, Viticultural Expert.

Poultry Notes.

FEBRUARY.

JAMES HADLINGTON, **Poultry Expert.**

DURING the next two months forward pullets of last season's hatching should be coming on to lay, and most poultry farmers will be more or less concerned with the question of selection, not only from the point of view of culling out inferior layers, but also in regard to the selections to be made for breeding stock.

In regard to culling unprofitable sorts there are considerations which should not be lost sight of; a pullet might be a reject from the point of view of being kept as a breeder on account of prospective low-laying qualities, and yet she might be a profit-producer from the fact that she might lay sufficient eggs to return a profit over her cost of feeding. This being the case, it follows that there is not a particularly large number to be culled where good development has been obtained, nor should culling be attempted in this class until they are well out in comb.

The greatest amount of culling to be done will be among the specimens that have failed to develop in such a manner as to make them prospectively profitable units, those, for instance, that have failed in growth, perhaps through being reared under adverse conditions, together with the constitutionally weak ones; most of these will be from the later hatchings. As a matter of experience there should be less than 10 per cent. of ordinary well-developed pullets failing to come up to a standard where they would return at least a margin of profit. Unfortunately, there are a large number of flocks where from the causes already mentioned it might be necessary to cull anything up to 30 per cent. These are cases where it is not so much a matter of culling by systems, but by the ability and experience of the farmer to determine a profitable standard of physique.

Measurement Tests.

In regard to the practice of selection by means of measurements, not only has an imperfect knowledge of the systems themselves resulted in hundreds of thousands of potentially good laying pullets being condemned as worthless, but what is worse, it has resulted in hundreds of thousands of inferior hens and pullets being selected as breeding stock that should never have found their way into the breeding pens. Much degeneracy has been the result.

Then there are other poultry farmers who have, perhaps, understood the systems better, but have erred in making them their sole guide to selection, ignoring physique and breed character, with the same result.

Knowing these systems, and with every opportunity of testing their true value, and surveying the poultry industry of this State as a whole, the writer is of opinion that an entire absence of knowledge on the subject would have been infinitely preferable to the imperfect and misapplied supposed knowledge that has been put into practice.

The undoubted fact should be realised that the poultry industry is suffering less from the inherited low fecundity of hens than from poor physique in our flocks, resulting in an enormous wastage of chickens annually. It is only by close attention to all the factors that go to secure better development with consequent better physique that we can hope to permanently retain or improve the laying capacity of our hens. In short, many breeders are stressing the factor of inheritance and neglecting those of physique and environment, which experience goes to show are at least equal in importance, if not more essential.

Hoganizing v. Trap-nesting in Determining Egg Production.

In a report* by the Director of the First All North-west Egg-laying Contest, Pullman, Washington, U.S.A., held 21st October, 1916, to 14th October, 1917, the results of a comparison between Mr. Hogan's predictions for the year and the actual trap-nest records are given. Mr. Hogan spent ten days in "scoring" 1,047 birds before they were placed in the permanent contest pen, the director of the contest serving as clerk for Mr. Hogan.

As is customary with most laying competitions, the birds had been subjected to long railway journeys previous to entering the contest, and an outbreak of roup occurred which may have checked laying. "On the other hand, the birds were afforded exceptional advantages in scrupulous cleanliness, an abundance of daylight in the building, a superabundance of fresh air, dry quarters, clean water, the moderate use of electric light to lengthen the short winter days, plentiful oat straw, and a balanced ration of high quality materials throughout. Several visiting poultrymen stated that, with the exception of exposure to roup, the birds had as good, if not better, care and feeding than prevailed in the best commercial poultry plants."

The following summary has been prepared of the results of the birds which completed the year in good condition, and readers can draw their own conclusions from the data.

It may, however, be mentioned that of the 714 birds which completed the contest in good condition out of the total entry of 1,032, approximately 13 per cent. were scored within 10 eggs of production, 9 per cent. within 11–20 eggs, 10 per cent. within 21–30 eggs, 9 per cent. within 31–40 eggs, 9 per cent. within 41–50 eggs, and 50 per cent. were scored more than 50 eggs from the actual production.

Buff Orpingtons which were scored highest, with one exception (viz., Black Orpingtons, of which only five birds finished the contest in good condition, and of these one did not lay a single egg), yielded the lowest results.

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* Published in the *Reliable Poultry Journal*, U.S.A.

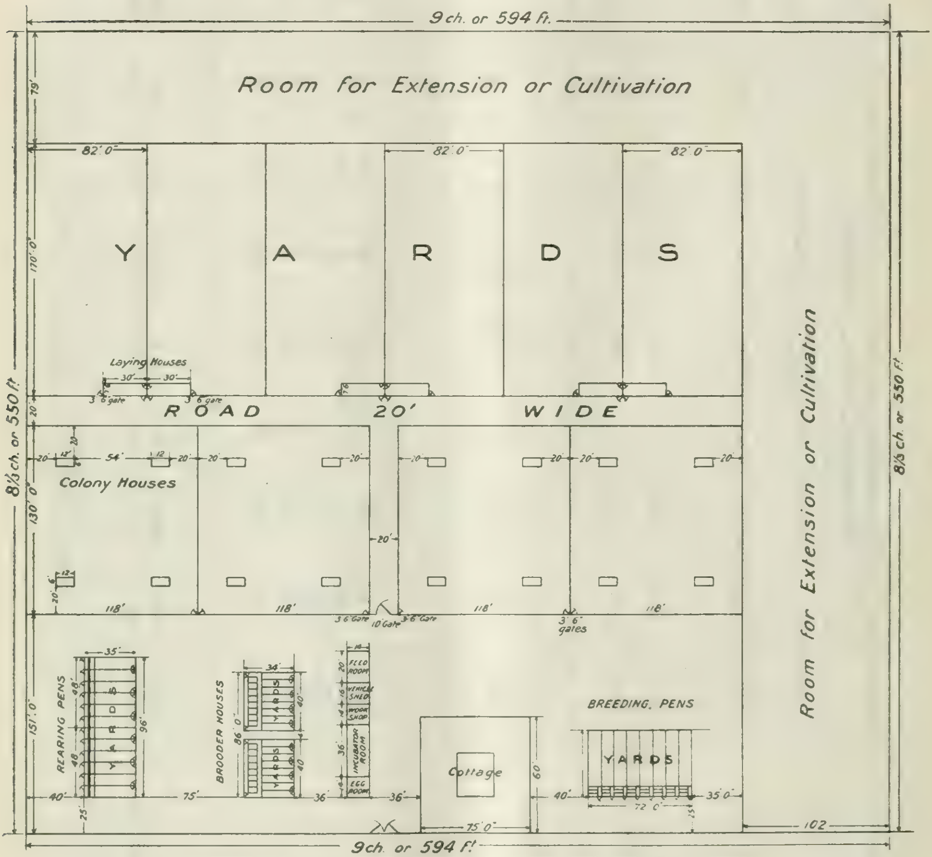
SUMMARY of Results in "Hoganizing" *v.* Trap-nesting at the First All North-west Egg-laying Contest, Pullman, Washington, U.S.A., 1916–17.

	Leghorns.		Plymouth Rocks.		Wyandottes.	Rhode Island.		Orpingtons.			Minorcas.	Miscellaneous Breeds.
	Single Comb, White.	Brown and Buff.	Barred.	White.	White.	Reds.	White.	Buff.	White.	Black.		
Number of Birds scored	504	36	90	24	114	120	6	54	12	6	24	42
,, ,, completed test in good condition	335	24	63	18	88	82	3	40	10	5	16	30
Number laid above prediction ...	136	8	11	1	16	Not stated.	0	0	1	0	6	5
,, ,, equal to ,, ...	0	0	1	0	0		0	0	0	0	0	0
,, ,, below ,, ...	199	16	51	17	72		3	40	9	5	10	25
Difference above or below prediction—												
1–10 eggs	49	1	7	1	8	15	0	0	0	0	4	5
11–20 ,, ...	31	3	8	1	7	7	0	0	2	0	3	2
21–30 ,, ...	36	6	7	2	3	9	1	0	1	0	3	2
31–40 ,, ...	37	4	9	2	5	2	0	3	1	0	2	2
41–50 ,, ...	21	0	6	2	11	8	2	7	1	0	3	1
more than 50 ,, ...	161	10	25	10	54	34	0	30	5	5	1	18
Egg average—												
Prediction per hen	144·5	138·0	168·2	181·6	148	140·3	160	191	163·9	163	135·8	138·9
Actual production per hen .	129·9	102	127·2	122·1	97·6	112·0	122	84·6	102·6	43*	121·2	96 9

* One hen never laid an egg, though scored 190 eggs.

Laying out a Poultry Farm.

Reference was made in last month's notes to the factors which govern the lay-out of a poultry farm. The plan now illustrated may be compared with the one which has already appeared in the *Gazette* and in "Poultry Farming in New South Wales." It will be seen that the block is nearly square, and has a fall in a different direction (due north), and these factors necessitate a different arrangement of the colony houses and yards. This plan is published with a view to showing how the same general principles can be applied to areas of different sizes, shapes, and contours.



Suggested Plan of 7½-acre farm where the fall is away from the cottage.

The North is towards the top of the Plan.

Roup.

The disease known as roup is more or less in evidence wherever poultry are kept. It affects both fowls and turkeys equally, and is most prevalent during the autumn and winter months. It often assumes epidemic form, when large numbers become affected. Many poultry keepers minimise the importance of this disease by calling it cold in the eye, head, &c. There are cases in which it is a more or less catarrhal affection, but which if neglected will develop into the condition known as roup, The disease may be chronic or acute in its incidence, the latter being generally very virulent and assuming epidemic form. Sometimes the eye only is affected; in other cases the whole of the respiratory passages in addition to the eye are attacked. In other cases there is an absence of it in the eye, while the air passages only are affected and the slit in the roof of the mouth is likely to get stopped up.

Usually this disease is almost entirely confined to growing stock, but during the last two or three months there has been a somewhat unusual epidemic among adult poultry. Strange to say, only in a small number of cases have the younger stock on the same farm been affected, while in others both young and old have suffered almost equally. Thus it will be seen that this disease has its vagaries, which must be reckoned with. A notable feature of the disease this season, in so far as the diphtheric form is concerned, has been the scantiness of the slimy membrane as compared with what is usually the case. This feature is likely to be somewhat misleading when making a diagnosis of the trouble.

Seeing that roup has doggedly persisted in its incidence practically all through the spring the outlook for the autumn months is not good, particularly where there is a large proportion of late-hatched or poorly-developed stock on the farm.

This disease has been previously dealt with in these notes, but owing to its extraordinary activity at the present time the information is again published.

There are three recognised kinds of the disease known as roup. The first, and most difficult to cure, is that affecting the head, with a putrid discharge from the nostrils, commencing like a catarrh, and often spreading to the eye, which becomes swollen and filled with pus. Apparently the organisms penetrate the tissues, and make this form very difficult and often impossible to cure. The cases that do respond to treatment are mostly those of stronger birds that are lightly affected. No internal medicine seems to have much effect upon it, and the main thing is to support the strength of the bird with good feeding, and perhaps a tonic, such as Douglas' mixture.

The best method of treating this form of roup is to syringe out the nostrils and, if necessary, the eyes at least twice a day with equal parts of peroxide of hydrogen and water; but the following may also be used with some measure of success:—Kerosene (undiluted), or a strong solution of permanganate of potash, or boracic acid and salt solution, using a teaspoonful of boracic acid and half a teaspoonful of common salt dissolved in half a pint of boiling water. If no other suitable syringe is handy, a common sewing-machine oil-can may be used for the purpose.

Particular attention should be directed to clearing the slit in the roof of the mouth.

A good way to get the bird to clear its head and nostrils of the mucus is to submerge the head up to the eyes in a solution of permanganate of potash made about the colour of claret. The immersion should take place for a few seconds, the bird's head being held in such a position that it cannot breathe without taking in the solution; this will cause it to eject much of the objectionable matter. If this is done previous to the syringing, the latter will be much more effective.

Diphtheric Roup.

The second kind is what is known as diphtheric roup, which is very like the true diphtheria in man. This may be recognised by a thick false membrane, somewhat of the character of mucus, filling the throat and mouth. This is most deadly if left to itself, as it will quickly choke the bird; but it is, perhaps, the most easily treated. Flowers of sulphur lightly dusted into the mouth and throat twice daily for two or three days will usually clear it.

Canker.

The third variety is known among poultrymen as canker. This form is less prevalent and, perhaps, less contagious than are the others; but it attacks young and old alike. It has, however, a less debilitating effect upon the birds. In fact, they may have this disease and still appear in the best of health. The symptoms of canker are a gasping or choking sensation, and the bird will sometimes cry out in its endeavour to get its breath. Upon examination they will be found to have a cheesy-looking substance growing round the windpipe, and sometimes in the mouth on the side of the throat or even on the tongue. In cases where it is round the windpipe it may grow to such an extent as to block up the air passage, causing asphyxiation. The remedy is to remove this substance with a piece of wire bent in the form of a small loop, taking care that the affected part is not made to bleed; also, when round the windpipe, that no particle is allowed to fall into that aperture or the result will be fatal. After the removal of the substance the affected part may be painted with a saturated solution of permanganate of potash or glycerine and iodine in the proportion of one part of iodine to ten of glycerine. Another, but rather drastic, remedy is to apply very finely powdered bluestone and permanganate of potash in equal quantities, well mixed. In each case the remedy should be applied twice daily.

In regard to roup in general, the point to emphasise is that while many cases are of such a light nature that they will yield to treatment, the bulk of them will not be found to do so, especially the first-mentioned kind, when it once gets a footing among debilitated or weak stock. One has only to consider the amount of persistent effort and care necessary to pull a human subject through an attack of diphtheria to realise how utterly hopeless it is to attempt to cure a large number of birds suffering from this disease.

Scientific research into the nature and cause of this disease among poultry has established the fact that it is not caused by any one specific microbe, but by a class of microbes; hence the difficulties in the way of preparing a serum with which to combat it, as is done in the case of diphtheria in human beings, although the two diseases are in many respects analogous, and, indeed, the disease of poultry is often called diphtheric roup. At any rate, no known success has been obtained by serum treatment so far, and roup still remains the most dreaded, because it is the most widespread, disease of poultry.

Good, airy, well-ventilated poultry-houses, and strong, well-developed stock are the best safeguards against it. Where the opposite conditions prevail, and the growing stock is kept crowded into small ill-ventilated houses, no amount of cleanliness, disinfecting, or dosing with chemicals will ensure immunity from this disease.

Nor is it apparently necessary to introduce an obviously infected bird into the yards to start it. The contagious or infectious nature of the trouble is admitted, but it is more or less endemic in character, and only requires favourable conditions to start it. The autumn is a time when those conditions are most pronounced, and when outbreaks are consequently most numerous. Prevention is more to be relied upon than cure. Fresh air, sunlight, roomy quarters, and prevention of crowding are necessary if epidemics of roup are to be escaped.

TEN-YEAR-OLD SILAGE.

CAPTAIN F. G. WALEY, of Mowbray Park, Picton, has submitted to the Department a sample of maize ensilage which was made in April, 1909, nearly ten years ago. The maize was cut in the milky stage of the cob, and the sample is now in a splendid state of preservation. The fermentation was perfect and the rich aroma like that of brewer's grains. Portion of the contents of the silo now being emptied was used in the drought of three years ago, leaving 60 or 70 tons in the bottom. This, at the time, was topped off again with wet straw and properly weighted.

The silage is used for feeding stud dairy cows, using a daily ration of 40 lb. with a little lucerne chaff and a handful of bran. On this, Captain Waley says, the cows are milking better than if on good grass.

A full description of the silos erected by Captain Waley was published in the *Agricultural Gazette* for October, 1907. They number four, and are twenty-four sided (practically circular), each being 16 feet in diameter and 24 feet high. They are grouped under one roof, and have an estimated capacity of about 140 tons in each tub, or 560 tons of silage in all. The construction is a reinforced concrete, and the cost of the four silos, including the shoot, was £350, erected on the spot.

The importance of being able to conserve highly succulent fodder in this way for use in dry periods cannot be overestimated.

Agricultural Bureau of New South Wales.

Suggested Subjects for Bureau Meetings.

It sometimes happens that, owing to some inadvertence, or perhaps the failure of the writer of a promised paper, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion:—

What mixture do you use for pickling seed wheat for the prevention of bunt? Have you tried the Department's formula—1½ per cent. solution of copper sulphate—and how does it compare with some of the rather rough-and-ready methods in use? Have you had any experience with lime-water after the bluestone solution, and have you noticed the effect when germination (*a*) has occurred at once, (*b*) has been delayed for some time?

Do you grade your seed wheat or oats to get rid of weed seeds and small light grains? The weeds are obviously objectionable, and the small grains tend to produce poor, unprofitable crops; what has been your experience with clean, well-graded samples of seed, compared with ungraded?

What differences have you observed between the germination of hard, sound grain and grain that has been saved from a crop that was exposed to much rain about harvest time? What quantity of the former class of seed would you allow per acre as compared with the class that has had to be used in the past two sowings, and what effect should the change in condition and quality of the seed have upon your sowing this season?

What crops have you been in the habit of raising in the orchard for green manuring purposes? Do you find legumes (such as field peas and vetches) any better than rye, barley, and the like? What have you found is the best time to sow the different classes of crop? Do you use fertilisers, and if so, of what kind, and in what quantity per acre?

What method of packing the harder fruits do you propose to adopt this season for the local and export trades—the straight or the diagonal, and what is the reason for your choice? Do you wrap the higher grade fruits in paper, and have you found any advantage in doing so?

What breeds of fowls have you kept, and what is your experience with the different breeds in respect of laying qualities, stamina, and physique? Have you found the chicks of any one of these breeds rear better than those of another breed? Give a few percentages of the chicks actually reared within your knowledge.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Albury.

Mr. J. Hadlington, Poultry Expert, lectured to an audience of about 100 at Albury, on 21st October:—

POULTRY KEEPING.

Mr. Hadlington said he had not visited Albury to advocate that all should become poultry farmers. A fair amount of money and a good deal of experience was required to make specialised poultry-farming a paying concern, and the experience was often bought very dearly. Distance from market and other handicaps, such as danger of tick infestation, were matters that could not be lost sight of. Poultry raising, as an adjunct, might be found profitable in the Albury district, but he was not too sanguine that operations on a big scale would be successful. In the Sydney metropolitan area it took many, who had every advantage in regard to the market, all their time to make a decent living. It might be argued that in the Albury district a poultry farmer could grow his own feed, but, in practice, it would be found a man could not grow feed and at the same time raise chickens. It was a matter of division of labour. If a man was engaged in poultry farming for a living he had not time to grow feed, except greenstuff. Farmers, however, should be encouraged to keep some fowls, and of the best breeds.

Dealing with the types and breeds of fowls, Mr. Hadlington illustrated on the screen many old and new breeds, and also good and bad types; and pointed out the danger of losing some of the best present-day breeds through the carelessness of those who styled themselves utility poultry farmers. Utility could be attained without departing in the least from type. It was only through want of knowledge that breeds were becoming so much mixed up. The fact that a bird was black was no proof it was an Orpington. Put feathers on the same bird's legs, and many so-called breeders would mistake it for a Langshan. This showed that a thorough knowledge of true type was essential to the breeder. With Wyandottes the trouble invariably was that too much attention was given to the production of the lacing, while type received only secondary consideration. The degeneration that was taking place was forcibly illustrated. The departure from type and standards came in for strong condemnation, and the lecturer said it behoved all who valued good breeds to work together to preserve them. Illustrations of strong and weak specimens were shown, and of chickens that had been bred from poor specimens and badly reared.

A number of slides were screened, illustrating fowl tick and the disease (spirochætosis) with which infested fowls became inoculated. He had found in every district in which tick was prevalent an impression amongst poultry men that this disease was cholera. Ticks were the only parasites that were known to inoculate fowls with this disease. There was only one remedy, and that was to get rid of tick. This was not to be accomplished by burning down fowlhouses, but by spraying them thoroughly with kerosene emulsion. The emulsion was made by taking, say, ½ lb. of soft soap, and dissolving it in hot water, and then adding slowly, while stirring, 1 gallon of kerosene. The mixture should be properly emulsified by agitation with a flat stick for about ten minutes. This mixture was called the "stock," and, when it was about to be used, 10 gallons of warm soft water should be added, stirring during dilution, and also while it was being applied. Any of the force pumps used by gardeners or orchardists would be found effective for applying the emulsion.

With regard to the rearing of chickens, it was pointed out that it was a huge mistake to feed the chicks as soon as they left the shell. They should be left without food for thirty-six to forty-eight hours after they were hatched. Feeding could safely be commenced if this was done without any fear of scouring. It was a mistake to think that bran was the cause of diarrhœa.

Mr. J. T. Moody, Assistant Fruit Expert, visited the district on 5th December, and gave a lecture at Lavington on fruit-growing, and a demonstration of summer pruning in the same locality.

LECTURE AND DEMONSTRATION.

Fruit-growing was described as one of the most expensive branches of agriculture in which to venture, owing to no returns coming in for five years. It was estimated that it cost from £60 to £70 per acre to bring an orchard into bearing. Orchardists should start strictly according to their means. It was desirable that more capital should be expended on the orchard than on the erection of a house. Small fruits and vegetables could be grown to tide growers over the first five years, and pig-breeding could help to meet some of the initial expenses. Good money could also be made from poultry-raising and bee-keeping. Clearing must be thoroughly done. It would be better to plant a few acres every year on good working lines than a large area in a slovenly manner. In grubbing out trees, the roots should be taken out to a depth of at least a foot, to permit deep cultivation. In big orchards, buildings should be erected in the centre. The square system was the best for planting trees. The trees should be 20 feet apart at the least—in drier districts 24 feet apart. He recommended subsoiling, also trimming the roots of trees before planting, unless the roots were short. The purchase of cheap trees was deprecated. The centre wood of trees should be cut out, leaving only three branches, and cultivating the low trunk system.

Intending orchardists should not plant too big a block with one variety of fruit, as it prevented satisfactory cross-fertilisation. Drainage was a most important feature, as it had the effect of aerating the soil and assisting soil bacteria. Drains should be 3 feet deep. Wind-breaks served a very useful purpose, but the trees should be 40 feet away from the nearest fruit trees. Orchards should be ploughed during the autumn and again in the spring, the latter ploughing not later than August in that district. Humus was best provided by growing leguminous plants, rye, Skinless barley and oats, which could be easily ploughed under. The spring-tooth cultivator was the best implement for cultivating purposes, and it should be used twice monthly. For ploughing he recommended low-set ploughs.

All deciduous trees should be sprayed with lime-sulphur solution, which was both a fungicide and an insecticide. Pressure was the main thing in spraying. Some motor sprays gave a pressure up to 250 lb. per square inch. The lady-bird was the orchardist's "best friend," as it kept scale and aphis in check. Next to good cultivation, sunlight in the centre of the trees was of importance. The best month for summer pruning trees that were in bearing was February. Every attention should be paid to the grading and packing of fruit. The advantages of organisation and co-operation amongst growers were also pointed out.

The pruning demonstration attracted a considerable number of growers, and proved most valuable.

The annual meeting was held on 19th December, Mr. J. Braun presiding. The election of officers resulted thus :—Chairman, Mr. J. Braun ; Vice-Chairman, Mr. J. Fleming ; Treasurer, Mr. H. Hogue ; Secretary, Mr. A. Buckhorn ; Assistant Secretaries, Mr. J. B. Wignell (Thurgoona) and Mr. H. Eberle, senior (Albury).

Bankstown.

A lecture was delivered on 9th December by Mr. Darnell-Smith, Biologist of the Department, on plant diseases, an account being given of a number of the most significant troubles and of the means by which they spread.

At the invitation of Mr. E. N. Ward, Superintendent of the Botanic Gardens, members spent a recent Saturday afternoon in the Gardens inspecting a number of interesting things, especially the onion and potato plots that are being electrically treated in an effort to ascertain the effect upon plant growth.

Bimbaya.

This branch discussed the subject of weeds on 19th December, a large and varied collection of weeds being brought by members, and their peculiarities and methods of control were discussed very usefully. Several weeds that were unknown were forwarded to the Government Botanist for identification. The weeds most discussed were thorn-apple, or false castor-oil plant, and the stinging nettle, or dwarf nettle.

Cardiff.

A meeting of this branch was held on 21st December, when Mr. A. Barrett read a useful paper.

PICKING AND PACKING STONE FRUIT.

The grower should be careful to avoid picking when the fruit is wet, either with rain or with a heavy dew, as it is then inclined to go bad quickly. It pays the grower to watch the weather closely during the picking time. If he sees conditions developing that indicate a heat wave approaching he will probably save a lot of fruit if he gets his picking done as early as possible in the day, while it is firm and cool. Fruit so picked will carry to market and arrive in a much better condition than that which is picked in a heated state, for it is apt to soften too quickly, and to get bruised and damaged in transit. Such fruit has to be sold quickly and generally at a low rate, or it will become a total loss to the grower.

The picker should have an intimate knowledge of the variety he is dealing with so that it will not be necessary for him to squeeze the fruit to know if it is fit for picking. He should be able to tell at a glance what is ready for pulling. This should be done with care, especially where the fruit is in bunches or closely packed along the branches. If the grower can keep his trees low he will save a lot of labour. The use of shallow boxes which can be left in the packing shed till emptied is advisable to avoid tipping out.

In selecting what the picker thinks is ready for marketing, size and colour should be the determining factors. There again it is necessary to have a good knowledge of each variety, seeing that there are great variations both in size and colour. Early varieties maturing quickly are generally medium-sized fruit, and often lack the rich colouring of the later sorts. Situated as we are, so close to our markets, it is not necessary to pick till the fruit is within a day or two of ripening, when it is in its prime.

The practice of stripping the trees at one picking is to be condemned, as, unless it is well graded, such fruit will tend to glut the market and bring down prices very quickly, whereas if the picking is done by gradually thinning out well developed fruits, what is left will fill out and improve in size and quality. The stripping method must give the trees a shock and affect them injuriously, owing to the interruption of the natural flow of the sap within the tree.

Packing is undoubtedly an important item in the marketing of fruit. It is necessary, if the grower wishes to see his fruit sell readily, to grade and pack it well. One point that needs emphasising is that buyers like to see the cases well filled with even-sized specimens so that by counting the top row they can easily reckon up the number contained in the case. Much could be learned by beginners from a visit to the saleroom where the packs of the different growers can be seen. If graded, the fruit, when packed in the flat half-bushel cases that are generally used for the stone fruits, will usually consist of two grades, viz., three-row and two-row qualities. Care should be taken with the three-row peaches to avoid getting them too high above the sides of the case, as the top layer will get bruised and spoil the appearance of the whole case, thus lowering its value.

A paper was also read by Mr. S. Hopkins, of which a summary follows:—

CAULIFLOWER CULTURE.

The seed should be sown at the middle or end of December, on ground that has been worked three times, about 15 inches deep. For early sowing Arlington is the best variety, and for mid-season Gilt Edge. A dressing of stable or fowl manure should be given when the ground is being prepared, but superphosphate, sulphate of ammonia, and sulphate of potash are also useful. The December sowing ensures the plants maturing in time for a good market. If planted out 2 feet apart each way about 5,000 plants will be required per half acre. The soil should be worked frequently with a pronged hoe during growth, and drawing the soil to them as they grow so as to form a trench that on a sidling will intercept the rain. Set out only strong plants, and when they are heading give plenty of water.

Cotta Walla.

A paper was read by Mr. J. C. Weatherspoon at a meeting held on 25th November, and a summary follows :—

ESTIMATING AMOUNT OF HAY CUT BY BINDER TWINE USED.

At harvest time one often hears farmers refer to the number of balls of binder twine used in cutting certain paddocks as an indication of the yield of hay. There is no doubt that this should be a simple and reasonably accurate way of estimating the quantity of hay cut, if there was any reliable data to go upon. The trouble is that there are few farmers who agree on this point, and the investigator is, therefore, at a loss to know whose opinion is correct. With the object of determining the amount of hay cut per ball of binder twine, the Principal of Roseworthy Agricultural College collected data covering a period of six years, from 1911 to 1916 inclusive. These figures show considerable variation each season, the maximum amount of hay cut per ball being 2 tons 6 cwt. 65 lb , and the minimum 1 ton 14 cwt. 3 lb. The average yield of hay per acre during the six years was 1 ton 13 cwt. 82 lb., and the average amount of hay cut per ball was set down as 2 tons 1 cwt. Referring to the experiments the Principal says: "For the past season the amount of twine used per ton of hay has been lower than all preceding years, with the exception of 1911. The figures, however, must be understood as applying to a year when harvesting was beset with great difficulty.

In many instances the binders could only work advantageously in one, or at most two, directions, and even then it was by no means an easy matter to prevent the knotters from missing sheaves. The result was that the proportion of untied sheaves was unusually high, and as no account of the loose stuff as distinct from the sheaved hay was kept, the ball of twine has received more credit than is strictly due to it.

This is an accidental factor which disturbs our records occasionally, but it does not seriously affect the main figures for a period of several years."

On the average then, the amount of hay bound per ball of binder twine works out at 2 tons 1 cwt. The figures may be taken as a fairly reliable and useful guide to farmers in ordering their requirements of binder twine, and in estimating the amount of hay cut.

Cunningham.

A meeting of members was held on 15th November, when a discussion took place on the methods of classing and handling wool advocated by Mr. J. W. Mathews, Sheep and Wool Expert, during his recent visit. The hope was freely expressed that another demonstration would take place next year.

At a meeting on 20th December, a parcel of books from the Principal Librarian, Sydney, was turned over with great interest, members being much impressed with the value of the reading matter thus made available to them.

Dural.

There was a very good attendance on 15th November, when a lecture on veterinary subjects was delivered by Mr. F. Whitehouse, B.V.Sc. Unsoundness in horses, swine fever and milk fever were mentioned particularly. Maize (as the best grain feed for hard work), oats (as an occasional change), and wheat (boiled), were recommended for feeding horses. A good drench for worms was one tablespoonful of turpentine to one pint of raw linseed oil.

At the December meeting the fruit questions asked in the November issue of the *Agricultural Gazette* were discussed, and the answers given by men of experience were as follows :—

Summer fruit should be picked for distant markets when as nearly fully developed as possible, but well on the green side. When picked like this, fruit, plums especially, will colour in the case. Jam companies nearly always ask for plums to be sent green. Of course, discretion has to be used so that fruit is not sent in too immature.

Apples, pears, and peaches should always be classed into three grades, and plums when circumstances permit and the crop is not too heavy. When the plum crop is heavy it does not pay to grade, the cost of handling being too great in proportion to the price received.

The varieties said to pack and carry most satisfactorily were :—

Plums.—Evans', Loutherborough, Wickson, Tibbett, Shiro, Angelina, Diamond.

Apples.—Mobb's Royal, Lord Nelson, Carrington (if pulled at right stage), Jupp.

Peaches.—Ruby Red, Devlin, Newington, Royal George.

Glenorie.

At a meeting on 28th December, the classes of fruit most profitable and suitable for the district were discussed. Citrus grew well and matured early, giving good returns, mandarins, the best varieties of common oranges, and Late Valencia being most prolific. Summer fruits do well, especially early apples and plums, but they are not much grown owing to the length of the cartage to the rail.

Holbrook.

On 26th November, Mr. H. C. Stening, Inspector of Agriculture, visited this branch for the purpose of delivering a lecture at the local experimental plots, but owing to the fact that most of the farmers were busy harvesting hay, the attendance was poor. Mr. Stening made a few remarks upon the plots and replied to questions, the time proving profitable to those who attended.

Inverell.

At the December meeting of this branch, arrangements were made for an early visit by Mr. Brereton, Assistant Fruit Expert. The Chairman urged a canvass for more members and an increase during the coming year in the number of papers read.

Lidcombe.

On 16th December Mr. H. E. Laffer, Viticultural Expert, delivered a lecture on grape vines and their diseases to a good audience.

Grape Vines and their Diseases.

Dealing with the vine from the point of view of the private householder, Mr. Laffer said the successful growth of a vine depended upon its treatment; it would give a greater return in the value of its fruit than almost any other plant. Half a dozen vines, if carefully treated, were sufficient for a householder for his own use.

The vine would adapt itself to almost any soil. The soil influenced the growth and development of the vine, and the character of its fruit; but the best results were obtained from soils of a loamy texture, which retained moisture better than clays or soils of a sandy nature.

Clay soils such as abound near Lidcombe were not ideal for grape culture, but with water and manure the vine would grow to perfection.

Mr. Laffer demonstrated on the blackboard the method of preparing cuttings and planting them, also the pruning and training of the vine both in its younger stages and in maturity. He advocated the bush system of training for certain varieties, no trellis being necessary, and deprecated too much pinching back of the summer growth—pointing out that the leaves were the lungs of the plant, and that too much topping deprived the fruit of the essential saccharine elements.

A water shoot (*i.e.* a shoot springing from old wood and commonly known as a sucker) must have two years' growth behind it before it becomes fruit-bearing wood.

Dealing with diseases of the vine, Mr. Laffer said that all fungi were lowly organised forms of plant life, and needed certain atmospheric conditions for their development. Dry periods were against them, and hence this season all Australia was comparatively free from vine disease.

Oïdium (an outward-growing type seen on the leaves and canes) was originally transported from America to Europe, and thence its distribution became world-wide. It was easily distinguishable by its mouldy appearance and smell. Black Spot, an internal type of disease, was of very old European origin. Downy Mildew had not been noticed in Australia until two years ago. It was introduced from America to Europe some forty years ago, when it devastated the major portion of the vineyards. If proper remedies were applied at the right time there was every hope of holding it in check.

Black Spot and Downy Mildew could not be seen by the naked eye; it was only the effects of these diseases that could be seen, as they developed internally. Should the spores be deposited upon a leaf or stem, the root system (mycelium) of the parasite quickly developed in the vine. The remedies were preventive only, not curative, unless the affected portion of the vine was cut away and destroyed. Oïdium would develop in cloudy and muggy weather, and even in sunshiny weather if humidity was present. A week of rainy weather might even this season produce Downy Mildew and Black Spot in the county of Cumberland.

As to remedies, for Oïdium nothing equalled flowers of sulphur, as proved by fifty to sixty years' practice. At that moment the vines were teeming with spores only awaiting suitable conditions to develop.

Swabbing the vine during winter with 10 per cent. sulphuric acid should be followed up with an application of Bordeaux mixture when the growth of the plant had reached from 4 to 6 inches. The same treatment should be adopted when Downy Mildew put in an appearance.

Mr. Laffer pointed out that the making of Bordeaux mixture was as important as the method of its application, and showed his audience how to properly prepare the mixture.

The fortnightly meeting held on 30th December took the form of a social. A musical programme and goodfellowship made a pleasant evening of the last meeting of the old year.

The committee hopes to make the influence of the Bureau in Lidcombe wider in the New Year than in the past.

Lisarow.

Mr. W. W. Froggatt, Government Entomologist, delivered a lecture on orchard pests, under the auspices of this branch, on 18th November, before an appreciative audience. At the conclusion Mr. Froggatt answered a number of questions, and was accorded a very hearty vote of thanks. While at Lisarow, Mr. Froggatt gave advice as to how to treat onions for thrips, recommending spraying with a nicotine solution of good commercial quality.

A meeting was also held on 16th December, when a committee was elected to organise a "village exhibit" for the Gosford show. Arrangements were made to ensure the district being well represented.

Matcham.

A meeting of members was held on 14th December, when the arrangements were advanced for the branch's part in the Gosford show.

Middle Dural.

Members met on 2nd January when, formal business being disposed of, a useful discussion on the growing of fodder crops followed. Mr. J. T. Eagle exhibited samples of Algerian oaten hay in sheaf, and oats and other fodder crops were considered, Sudan grass, Kafir corn, and several of the sorghums being mentioned. Mr. Eagle's sample of oaten hay was regarded as highly satisfactory, and reflecting credit on the producer, notwithstanding the very dry spell. The oats, he said, grew 3 feet high on fallowed land, and 2 feet high on non-fallowed. The crop was manured with one part superphosphate to two parts blood and bone. The stems were of nice thickness, very clean and bright, with plenty of leaves and abundance of head, which carried the grain well. The crop ran 2 tons per acre.

Miranda.

Mr. J. T. Moody, Assistant Fruit Expert, gave a very interesting lecture under the auspices of this branch on 2nd December, on fruit culture. This lecture was very much appreciated, as fruit-growing has a prominent place in the district.

Penrose-Kareela.

At a meeting on 22nd December, Mr. J. T. Moody, Assistant Fruit Expert, delivered a lecture on fruit-growing, in which was conveyed a large amount of practical information. He strongly urged co-operation among growers as a means of putting the industry on a sounder basis than in the past.

Spencer.

At a meeting of the members of this branch held on 14th December a discussion took place on the demands of the Australian Workers' Union, as affecting fruitgrowers. All the members present considered the demands to be serious in the probable effect on the industry.

Stratford.

A paper on forestry subjects was read by Mr. P. H. Deards, and from it are taken the following paragraphs:—

FORESTRY.

We have in this locality the following hardwood timbers, viz., ironbark (grey and red), grey gum, blue gum, spotted gum, narrow-leafed red gum, forest red gum, stringybark, white and red mahogany, brush box, blackbutt, grey box, turpentine, tallow-wood. Among the softwoods may be found red cedar, silky oak, pine, beech, corkwood, &c. The hardwoods may be mentioned in the following order, as regards their durability when placed in the ground, as for fencing, &c.:—Narrow-leafed gum (*E. tereticornis*), red mahogany (*E. resinifera*), white mahogany (*E. acmenioides*), stringybark (*E. capitellata*), turpentine (*Syncarpia laurifolia*), tallow-wood (*E. microcorys*), ironbark (*E. paniculata*), blackbutt (*E. pilularis*), red gum (*E. tereticornis*).

The other timbers mentioned (grey gum, blue gum, spotted gum, brush box, and grey box) should never be used in the ground as they rot off at ground level in a very few years. Such timbers, however, make excellent rails, and are very durable when kept off the ground, except in the case of grey box, which is very susceptible to the ravages of white ants. The reason for placing narrow-leafed gum and red mahogany before all other timbers is because of their great durability, practical immunity from white ants, and smaller risks from burning during bush fires. I have seen narrow-leafed gum posts removed after forty years' service, and they were quite sound and some were even of a sappy nature.

In this district are the remains of an old fence, which the oldest residents say was erected nearly seventy years ago. The timbers are red mahogany, not more than 2 inches thick by 8 inches wide, and even now an occasional sound post may be found. White mahogany is also a very fine fencing timber, very durable, and easily worked, being mostly of a free nature. There is very little to choose between white and red mahogany for fencing purposes. An objection to this timber for milling is its tendency for rings, making it difficult to cut it into large pieces.

Stringybark, turpentine, and tallow-wood are about equal for fencing material, but turpentine is of great value for piles in the construction of wharves, &c., and is rarely attacked by the teredo, especially when the bark is left on, as the sap or gum seems to deter them.

My objection to ironbark is its susceptibility to white ants, and its greater danger from fire. White ants appear to eat this timber more than any other in this district, and the sap drying off very quickly makes it very apt to catch fire. I have on my property ironbark and red mahogany posts side by side. The ironbark is very much eaten with white ants and the sap decayed, while the red mahogany is as sound as when erected fifteen years ago. Ironbark is, of course, a very strong timber, and cannot be excelled in the building of trucks or railway carriages, in fact anywhere where great strength is required. In bridge building, a timber that should be used to a much greater extent than at present is spotted gum. It is very durable if all the sap is removed. When the old bridge over the Karuah River at Booral was demolished, the only sound girder in the bridge was spotted gum, the ironbark being very much decayed. Broad-leafed red gum is a timber which does not appear to stand when placed in the ground ; and my objection to blackbutt is its free nature, as generally speaking a free timber will never last as long as a tough one (except white mahogany).

Conditions of growth affect the strength and durability of timbers. For instance, a timber grown on rich soil will not last nearly as long as when grown in a hard rocky situation. This is particularly noticeable in cutting squared timbers, the tree on rich soil being soft and in most cases free splitting, whilst that grown under harder conditions will be hard, tough, and much heavier, indicating a close grain, which tends to defy the elements.

My choice for rails or slabs is blue gum (*E. saligna*). It is usually very free and straight grained, making a very fine quality rail or slab. There is at present on a piece of cultivation land (about 1 acre in extent) on the Upper Allyn River, a blue gum tree (ringbarked, of course) which measures 33 feet in circumference 11 feet from the ground, with a trunk of 60 feet, and about 21 feet circumference at the top. This would give a mean average girth of 27 feet, and would contain roughly 32,000 superficial feet. With royalty at the rate of 1s. per 100 super. feet, this tree would be worth £16, or about three times the value of the land on which it stands. Many thousands of pounds worth of similar timber have been destroyed in New South Wales.

A forest is a national asset, for without timber most of our industries would have to be abandoned. For instance, in the case of a mine, there is no substitute for wooden props, slabs, &c. It is the duty of every person to protect our forests, especially in the prevention of bush fires. One fire would perhaps destroy many hundred pounds' worth of mature timber, as well as killing or checking the growth of younger trees. It is at present a punishable offence to carry wax vestas on a State forest during summer months, but this is a matter that is difficult to control, regardless of the number of forest officers employed.

At present the forests of this State are being placed on a much better basis, and the great waste of the past will certainly cease. It will, however, take years of labour and careful management to retrieve past negligence. England to-day is paying 14s. per sleeper, which previous to the war she could produce locally for 4s. 6d.

Had our forests not been placed under independent control, the same conditions would have existed here in a few generations. Even now some of our timbers are almost cut out. For example, pine for butter boxes is becoming scarce. Personally I believe corkwood would make an excellent substitute.

A forest is also of very great value as regards rainfall. In France, previous to the war, a great deal had been done in reafforestation. Following the destruction of the dense pine scrubs of the coast, the rainfall decreased to such an alarming extent that the authorities decided to replant the forests, and to-day the rainfall of France is again normal. In my opinion this district is very fortunate in having two such large areas of land as the Craven and Verulam State Forests set apart for our future timber supply.

The question, which is the best all-round timber in the district, was put to the meeting, and the result was an agreement that narrow-leafed gum was best.

Tennyson.

The members of this branch met on 7th December, when representations were made to the Pastures Protection Board that the destruction of rabbits be enforced, and also that steps should be taken by the proper local authority to have the shrub known as " blackthorn " declared a noxious plant.

The branch is working hard to secure a settlement for the returned soldiers located in the district, members being confident that pea-growing, as a preliminary to citrus, is a particularly suitable occupation, the success of which, locally, is already established.

Tingha.

A meeting of members was held on 4th January. On account of the extremely unfavourable season it was decided to abandon the idea of holding an exhibition this year.

Mr. Vickery raised the question whether the black stain resulting from the action of sap on the steel of the pruning knife was injurious to the tree, and cited instances where he considered harm had been caused. Other members, who were inclined to think little or no harm was caused, agreed to watch more closely to see if any effect could be detected.

Windsor.

Members met on 20th December, when the proposal to stage an exhibit at the Hawkesbury District show had to be abandoned owing to the weather conditions.

The questions in the November *Agricultural Gazette* were discussed.

On the dairying question, Mr. A. H. WILCHER said the cow when milked to within a couple of weeks of calving was not so healthy, and the calf was weedy. A cow should be three months in milk before being served again. The effect of milking right up to the time of calving was to shorten the next period of lactation, and to seriously reduce the yield. Two months should be allowed for drying off and calving. The milk from a cow in normal condition should not be used for human consumption before eight milkings had been made.

On the orchard question, Mr. W. SMITH said that fruit should be as near maturity as possible, but on the firm side. It should not be gathered too green, but frequent pickings should be made to ensure the best results. Mr. A. SMITH favoured three grades—very large, large, and medium. Where there was much small fruit, it was advisable to have a fourth grade, but this was usually best avoided by thinning. Mr. F. GARDINER considered the best early peaches were Governor Garland and Duffy's Christmas Box; and Mr. J. GREGORY also favoured Hales' Early; and others mentioned were Briggs' Red May, Admiral Dewey, Triumph, and Wiggins. The apricot favoured was Newcastle, and the nectarines Newboy and Goldmine.

As to the question about harrowing maize, Mr. F. GARDINER said cultivation among young maize was necessary, chiefly for the conservation of moisture and the destruction of weeds; it also improved the physical texture of the soil, and facilitated nitrification. No one was in a position to mention the exact cost of cultivation.

Woonona and District.

There was a well-attended meeting of members of the above branch on 10th December. The principal business was matters in connection with the show.

The Secretary, who attended the Primary Producers' Conference held recently in Sydney, read a lengthy report on the papers read and discussed at the conference.

Yarramalong.

At a meeting on 8th January it was decided, owing to the severe drought conditions prevailing, that it would not be possible to compete at the Moss Vale show this year.

An interesting discussion on the merits of different varieties of food for pigs, and methods of feeding, ended the meeting.

Orchard Notes.

FEBRUARY.

W. J. ALLEN.

Harvesting.

PICKING, packing, and preparing fruit for market will no doubt be the most important work at the present time. There still appears to be a greater necessity for more careful attention to packing and grading. With the markets heavily supplied, poorly packed and badly graded fruit must prove a source of loss. Zante currants may be picked and dried this month; also pears, such as Williams. Many of the later peaches, plums, and prunes will be ready for harvesting.

Cultivation.

This work must still enter into the orchardist's progamme. Weeds have to be kept down, and the land maintained in a state of good tilth. The soil should be worked regularly and thoroughly with spring-tooth cultivators, so as to conserve as much moisture as possible. In citrus orchards, where good rains have fallen, it is now a good time to plough, not otherwise. On steep hillsides, and where land is liable to wash, shallow ploughing, left in the rough, seems to be the best practice.

If cultivation be neglected, weed growth during the rainy season may become excessive. Provided, however, the plough be used before the weeds become too rank, the addition of the humus (organic matter) obtained from the weeds is an advantage to the soil, and also helps in preventing erosion.

Diseases.

San José Scale, Codlin Moth, Fruit Fly, Woolly Aphis, and scale insects of citrus trees, are the principal insect pests which require attention this month. Growers in doubt as to any disease attacking their trees, should either communicate with their district Fruit Inspector, or forward specimens to the Department of Agriculture without delay. The necessary treatment for these and other diseases is published in Farmers' Bulletin No. 72, "Spraying," and may be had free upon application to the Under Secretary and Director, Department of Agriculture, Sydney.

Fumigation.

While this is considered one of the best months for carrying out this work, under no circumstance should it be done if the trees are out of condition through lack of moisture in the soil. A tree suffering from drought, or want of cultivation, can be easily damaged by either spraying or fumigating. Fumigation should be carried out at night, or during the cool part of the day, always avoiding hot days. During recent years we have carried out fumigation work in March and April, so as to avoid the hot weather of February. This seems to have been satisfactory, and the scale has been killed and the trees kept free from damage.

Manuring.

It has been found in the coastal districts that this month is a suitable time to apply artificial manures to citrus trees, especially where the trees have received a good supply of moisture. If the weather continues dry the application should be deferred.

Irrigation.

Dry seasons occur at intervals in our coastal districts. The result is that very often bearing citrus trees suffer considerably, causing them to drop their fruit. Some experienced growers have installed small pumping plants, with a view to supplying the necessary moisture when dry periods prevail. One cannot too highly commend this procedure, as for a very long time there has been need of overcoming the difficulty of protracted dry weather. Trees or vines which have not had an application of water for some time will, in all probability, require one this month, in districts where there has been no recent rain. In applying water, the land should be well soaked to a good depth, and immediately the soil is dry enough, the cultivator should be put at work and the land well stirred by at least two cultivations after each irrigation.

Cover Crops.

The sowing of cover crops is a satisfactory means of increasing the organic matter in many of our lighter coastal soils. Arrangements should now be made to secure seed for sowing and to prepare the land. No doubt there will be some difficulty experienced in obtaining such seed as vetches, grey field peas and other legumes, unless provision be made immediately. Fruit-growers are, however, not confined to legumes, as Skinless barley, rye, and rape are satisfactory for turning under.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1919.

Society.	Secretary.	Date.
Wentworth Falls A., H., and I. Society	C. P. O'Kelly	Feb. 5
Berry A. Association	W. Pryor	,, 5, 6
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 13, 14
Central Cumberland A. and H. Assocn. (Castle Hill)	H. A. Best	,, 14, 15
Manning River A. and H. Association	L. Plummer	,, 19, 20
Ulladulla A. and H. Association (Milton)	R. F. Cork	,, 19, 20
Coff's Harbour and District A. Society	C. Vost	,, 20, 21
Wollongong A., H., and I. Association	W. J. Cochrane	,, 20, 21, 22
Wyong District A. Association	C. N. Walters	,, 21, 22
Yanco Irrigation Area A. Society (Leeton)	T. H. Hogan	,, 25, 26
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 25, 26, 27
Dorrigo and Guy Fawkes A. Association	R. R. Blair	,, 26, 27
Gunning P., A., and I. Society	J. R. Turner	,, 26, 27
Moruya A. and P. Society	H. P. Jeffery	,, 26, 27
Newcastle A., H., and I. Association	E. J. Dann	,, 26, 27, 28; March 1

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1919.

Society.	Secretary.	Date.
Bathurst A., H., and P. Association	S. V. Turrell	Mar. 4, 5, 6
Tenterfield P., A., and M. Society	R. S. Smith	,, 4, 5, 6
Bega A., P., and H. Society	H. J. B. Grime	,, 5, 6
Bellinger River A. Association	J. F. Reynolds	,, 5, 6
Braidwood P., A., and H. Association	L. Chapman	,, 5, 6
Tumut A. and P. Association	T. E. Wilkinson	,, 5, 6
Berrima District A., H., and I. Society (Moss Vale)	J. W. Kenny	,, 6, 7, 8
Bangalow A. and I. Society	W. H. Reading	,, 11, 12
Cootamundra A., P., H., and I. Association	N. Gardner	,, 11, 12
P. and A. Assn. of Central New England (Glen Innes)	G. A. Priest	,, 11, 12, 13
Kangaroo Valley A. and H. Association	L. W. Vance	,, 12, 13
Nambucca A. and H. Association	M. Wallace	,, 12, 13
Tumbarumba and Upper Murray P. and A. Society	W. R. Figures	,, 12, 13
Orange A. and P. Association	W. J. I. Nancarrow	,, 12, 13, 14
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Goulburn A., P., and H. Society	H. C. Fraser	,, 13, 14, 15
Wellington P., A., and H. Society	A. E. Rotton	,, 18, 19
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Tamworth P. and A. Association	J. R. Wood	,, 25, 26, 27
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Dubbo P., A., and H. Association	F. Weston	,, 26, 27
Cooma P. and A. Association	C. J. Walmsley	,, 26, 27
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Nepean District A., H., and I. Society (Penrith)	C. J. Welch	,, 28, 29
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Quirindi District P., A., and H. Association	A. Pountney	,, 2, 3, 4
Camden A., H., and I. Society	A. E. Baldock	,, 3, 4, 5
Batlow A. Society	C. S. Gregory	,, 8, 9
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 9, 10
Royal Agricultural Society of N.S.W.	H. M. Somer	,, 15–23
Moree P. and A. Society	A. U. Ezzy	May 21, 22, 23
Parkes P., A., and H. Association	G. W. Seaborn	Aug. 20, 21
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 26, 27, 28
Corowa P., A., and H. Society	J. D. Fraser	Sept. 2, 3
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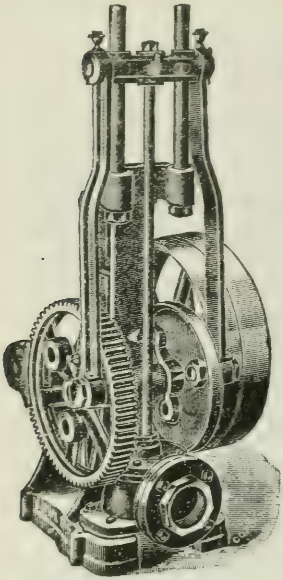

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3rd March, 1919.

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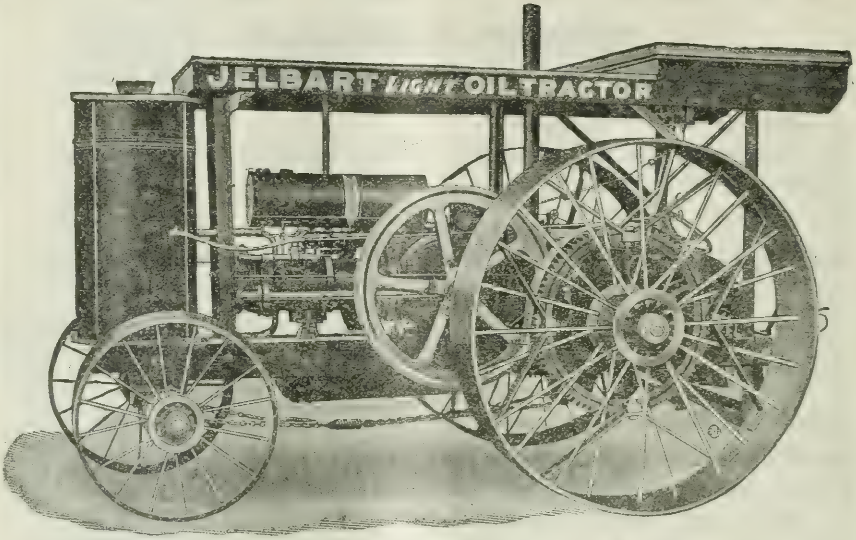

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Agricultural Gazette of New South Wales.

Land Clearing by Explosives.

C. W. BURROWS, Field Assistant.

THE question of land clearing, and how best to accomplish it thoroughly and cheaply, varies so widely in accordance with the number, variety and size of trees and stumps per acre, and the character of the soil, as to make it difficult to give a prescription which will apply to all cases. It therefore resolves itself into this—that no single method is to be recommended by itself, but rather an intelligent combination of all the methods and systems that come within the scope of the farmer's available plant.

With sufficient capital, plants of all styles and systems are within reach, and the "forest devil," 10-ton jack, traction engine, bullocks, &c., can be utilised as necessity demands; but to be successful, all these have still to depend on the axe and mattock and firestick, plus the hard toil of the man himself, which, however, may be reduced to a minimum by making explosives effect the greatest amount of execution.

One has only to watch a man hand-grubbing a forest giant in the heat of a summer day, and to follow him home in the evening, to really appreciate the magnitude of his task, and it is an open question if any of the systems or machines enumerated, used singly or even in combination, would have lightened his task to the same extent as a few packets—perhaps a few plugs—of gelignite would have done. After removing dray-loads of material in trenching round a tree or stump, in order to be able to swing the axe or mattock, roots may be met that the axe cannot reach, whereas an auger hole and a few plugs of gelignite (varying in number according to the size of the roots) will sever and shatter the hindrances and loosen up the surrounding soil at the same time. The same question arises when the forest devil or 10-ton jack, or any of the other mechanical devices for pulling down green timber are being used—that of getting rid of the trunk. Frequently the crosscut or lightning saw is used to cut the log into suitable lengths for handling, stacking and burning; but it would probably have been a much cheaper proposition to have frilled and poisoned the tree, and then, when dead, to have shattered it with gelignite and burn in an upright position, for trees burn much better upright, where every wind from heaven makes a draught, than when lying on the ground. Besides, the hot ashes falling from the burning upright tree operate considerably in "stoving" out the tree-roots. When the tree falls that section of the trunk, and any larger limbs that are not consumed by the fire, can be better handled with a little gelignite than by all the axes in the country, and with infinitely less labour and hard work, though the axe must be used on the lighter and more easily handled portions.

It is after the roots have been cut and the tree brought down and burned that the mechanical appliances come in for lifting out those roots that are above or too near the ploughing depth. Even the plough itself is of the greatest assistance in this root-running process, in turning as deep a furrow as is practicable along the line of the root before attempts are made to take it out with a devil or jack, or with teams and tackle.

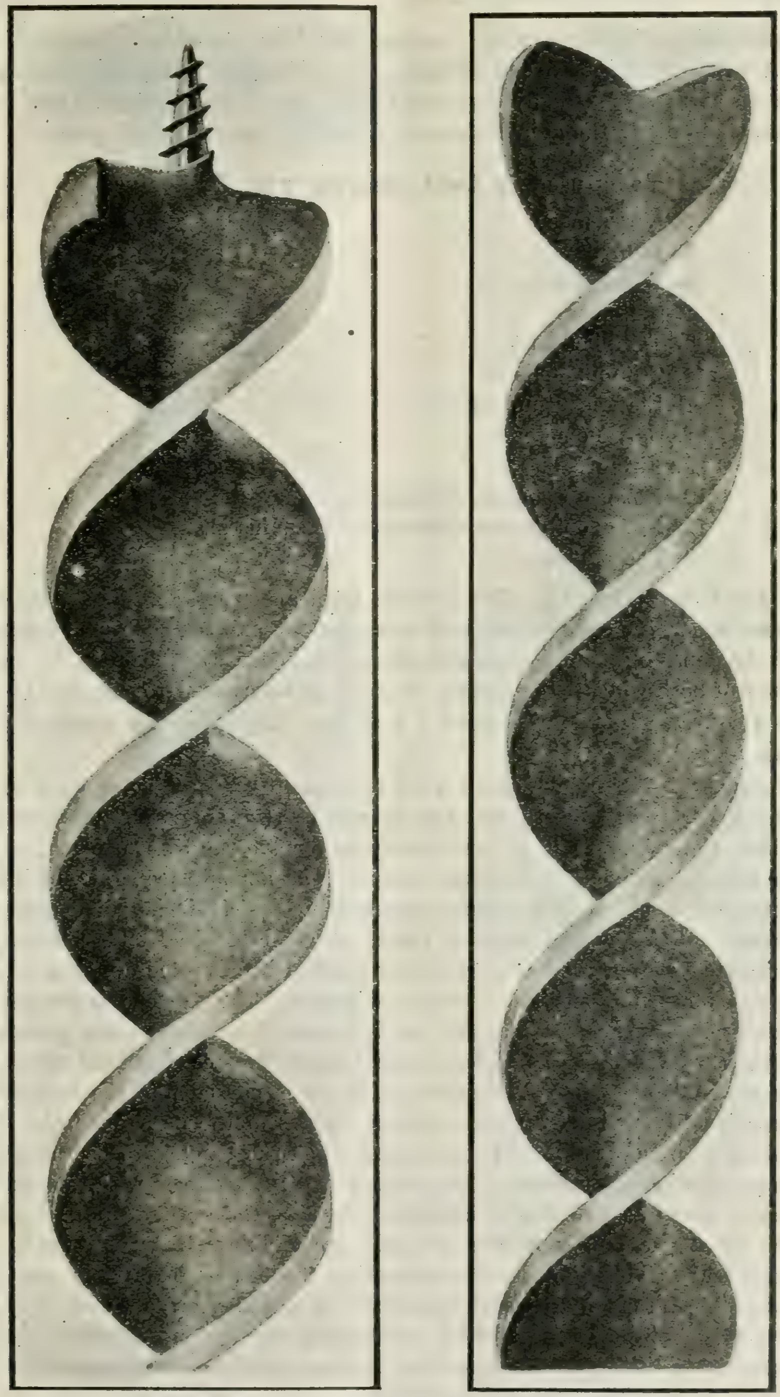
In some districts the root-running process is of a more complicated nature than others, owing to the extremely winding nature of the root growth within the ploughing depth. This necessitates their removal in short lengths, and the plough is only useful where the overlying soil interferes materially with the running of these roots. In western districts clearing is mostly done when the ground is in a moist condition, and mechanical means are mostly adopted. At such a time the roots are more easily withdrawn by the same mechanical means.

There is nothing more troublesome after the trees have been felled, all their limbs, branches and leaves burnt, and grass is beginning to appear, than the wilderness of blackened and half-burnt logs that is to be seen in almost any section of this State. These logs cause the farmer no end of worry and trouble, to say nothing about the loss in grass area and the time lost in lifting cattle and young stock out of the log pens. I have frequently been told that there is no light wood available, without endless carting, to burn off these blackened tree trunks, and such a proposition would be ruinous. But if gelignite never did anything else, it does just the very thing—and does it remarkably well—that is needful for dealing with such logs, it makes kindlings, and in making cords and cords of kindlings it converts large sections of those troublesome logs into the very condition that is essential, if rapid and effective burning off is to be accomplished.

Frilling and Poisoning preparatory to Clearing.

In new country, or in country covered with timber, whatever may be the use to which the land is to be put, whether straight-out farming or stock raising, mixed farming or dairying, the thing of first importance is to get rid of the evil influences of timber, if not the timber itself, and that method which gives the quickest results combined, of course, with efficiency, has most to recommend it. The eradication of the shade produced by the foliage of forest timber becomes the first care, since it robs the ground of essential sunlight. Next come the trees with their roots, which take all the plant food away from the soil, to the impoverishment of all and sundry crops and grasses.

Ordinary ringbarking is the method usually adopted, and if thoroughly done at the right season it is effective; but it is very slow, often taking well over twelve months to bring about the desired result. A better method is that of frilling and poisoning, as this kills in a few weeks, and often in a few days. Even with this method some trees will be more resistant and will sucker, no matter how carefully they may be treated; but, generally



Before cutting. After cutting.

Fig. 1.—Mathieson Wood Auger, to show method of converting into an Earth Auger, by cutting out the screw lead.

LAND CLEARING BY EXPLOSIVES

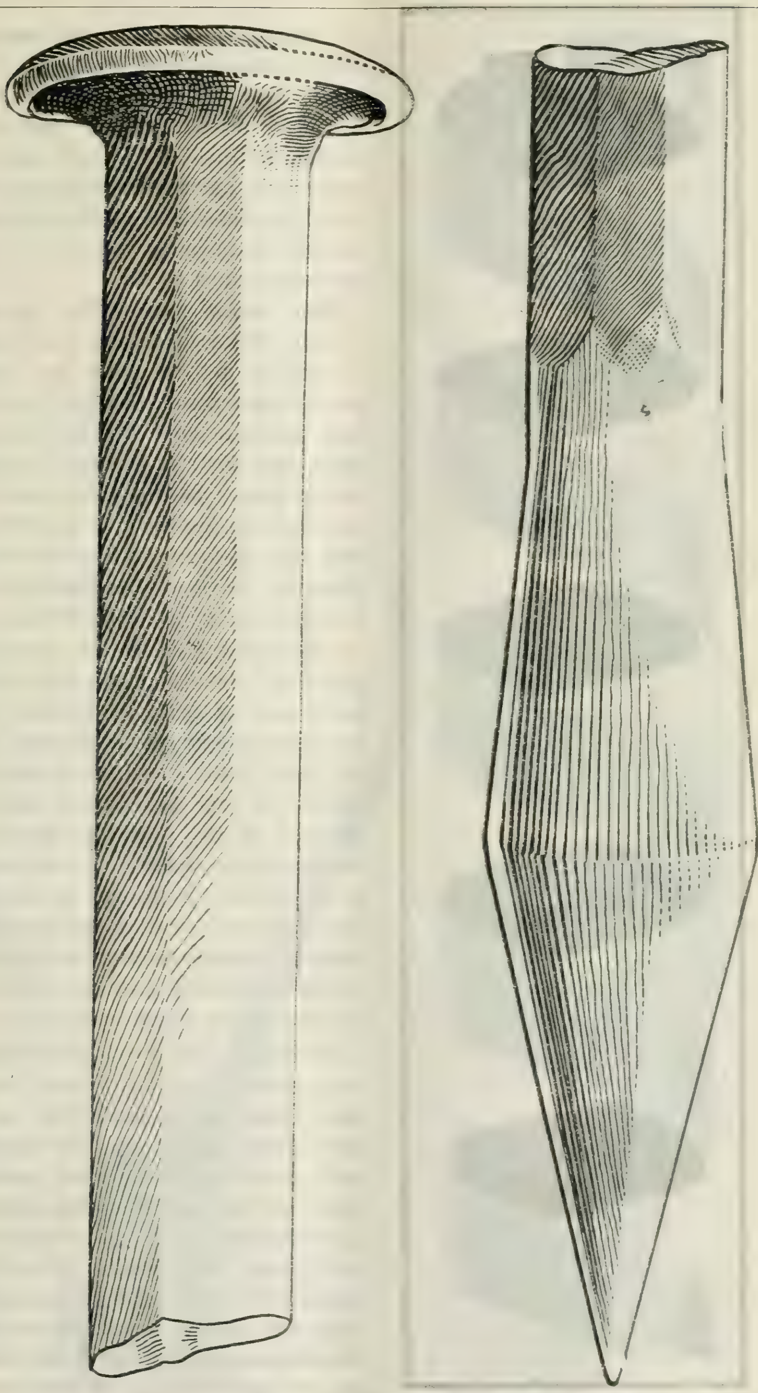
speaking, it is highly effective, enabling the dead timber to be handled well within twelve months, and affording the owner the additional advantages of an extra season and a sweetened soil, due to the timber having been allowed to die in the ground instead of having been cleared off green.

Tools used in Land Clearing with Explosives.

1. Earth auger.
2. Bulb bar.
3. Wood augers (two).
4. Chisel bar.
5. Tamping stick.
6. Crimping pliers.
7. Electric firing battery.
8. Galvanometer.
9. Firing cable.
10. No. 6 detonators (ordinary).
11. No. 6 detonators (electric or E.D. fuses).
12. The explosives.

Earth auger (Fig. 1).—This is made from an ordinary 1½-inch Mathieson wood auger, the centre screw lead being cut out and the auger end fishtailed to the depth of about ½ inch, and new cutting edges then filed on the proper sides of both wings; the handle or shank is lengthened to suit, but 4½ feet is a convenient length, as holes 4 feet deep are ample for practically all tap roots.

Bulb bar.—This tool was designed to expedite the placing of holes round and under trees and stumps, and as will be seen from the accompanying illustration (Fig. 2) it is unnecessary to remove the core of earth, as has to be done when using the earth auger. The bar is 5 feet long, of ⅞-inch octagonal steel, one end being thickened up to 1½ inches diameter, and drawn out to a fine point 3 inches long on the lead end; behind the thickened section the bar is gradually tapered back to the diameter of the bar (⅞ inch) for, perhaps, a couple of inches. The top end is headed for driving-in purposes. When this bar is in use, it is driven home preferably with a wooden maul, as a steel sledge knocks the steel bar head about too much. When it is about 8 inches in, water is poured into the hole made, and the driving is continued until the hole is of the desired depth. This makes a circular hole of 1½ inches, and when the bar has to be withdrawn there is only the friction of the bulb section to contend with, as the bar shank is so much smaller in diameter; besides, the water poured in during the driving operation follows the bulb down, lubricating the sides of the hole, and making the job of withdrawing the bar comparatively easy. It may happen that in driving this bar down, a root may be gone over or under, and this may make the task of withdrawing the bar more difficult, but it was to avoid this that the taper was designed at the back or top side of the bulb. In any case a 6-foot length of ¼-inch chain, double half-hitched round



Top. Bottom.

Fig. 2.—Top and Bottom Ends of Bulb-bar.

LAND CLEARING BY EXPLOSIVES.

the bar at the ground level, and then round a long rail or stout sapling, which can be used as a lever, will soon release it. Any blacksmith can make this implement; in fact, it might easily be made on the farm at a moderate cost. It will get through more than ten times as much work as the auger, and it will ease much hard work.

Wood augers (two)—The ordinary 1½-inch Mathieson wood auger (Fig. 1) similar to the one the earth auger is made from, is a highly efficient tool, though a good deal of trouble is often met with in getting it to start boring after it has been withdrawn for clearing purposes—which is necessary from time to time—on account of chips being left in when releasing the screw lead preparatory to withdrawing.

The L'Hommedieu or bull-nosed auger of 1½-inch diameter (Fig. 3) is a rapid and efficient wood-boring tool, but it needs a Mathieson auger to start the hole; usually an inch or two will suffice. It cuts quicker and with less exertion to the operator, and when withdrawn for clearing out the hole—as is necessary from time to time—it goes right down to the bottom at once, making re-starting easy and simple. A handle or shank 4 feet 6 inches long is a convenient length in each case.

Chisel bar.—This is a most useful tool, and a practically indispensable implement when using explosives, as so many trees and stumps have large, solid, or even hollow hip roots, partially under or very near the surface, where a grubbed hole, somewhat similar to a rabbit hole, but smaller, allows the charge to be bunched right up against the timber, causing a maximum amount of shattering, a result that is very desirable for rapid burning off afterwards.

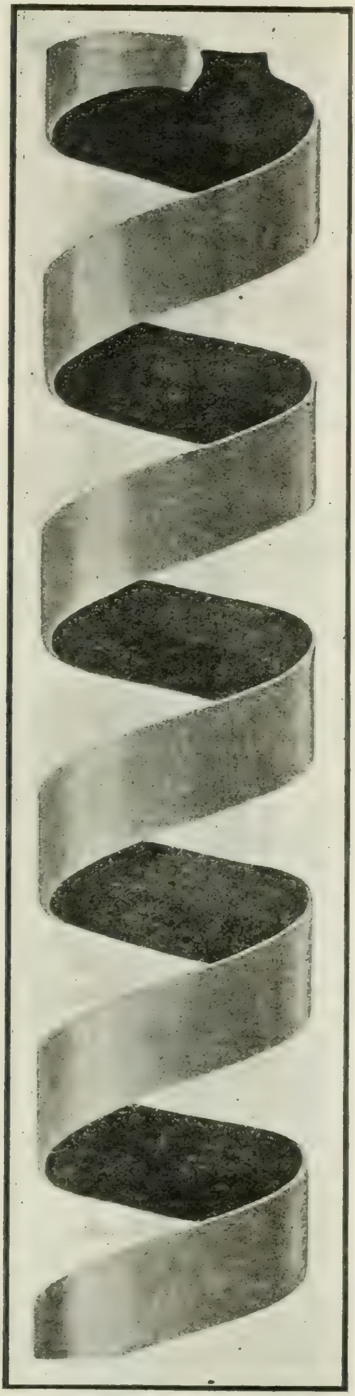


Fig. 3.—L'Hommedieu or Bull-nosed Auger.

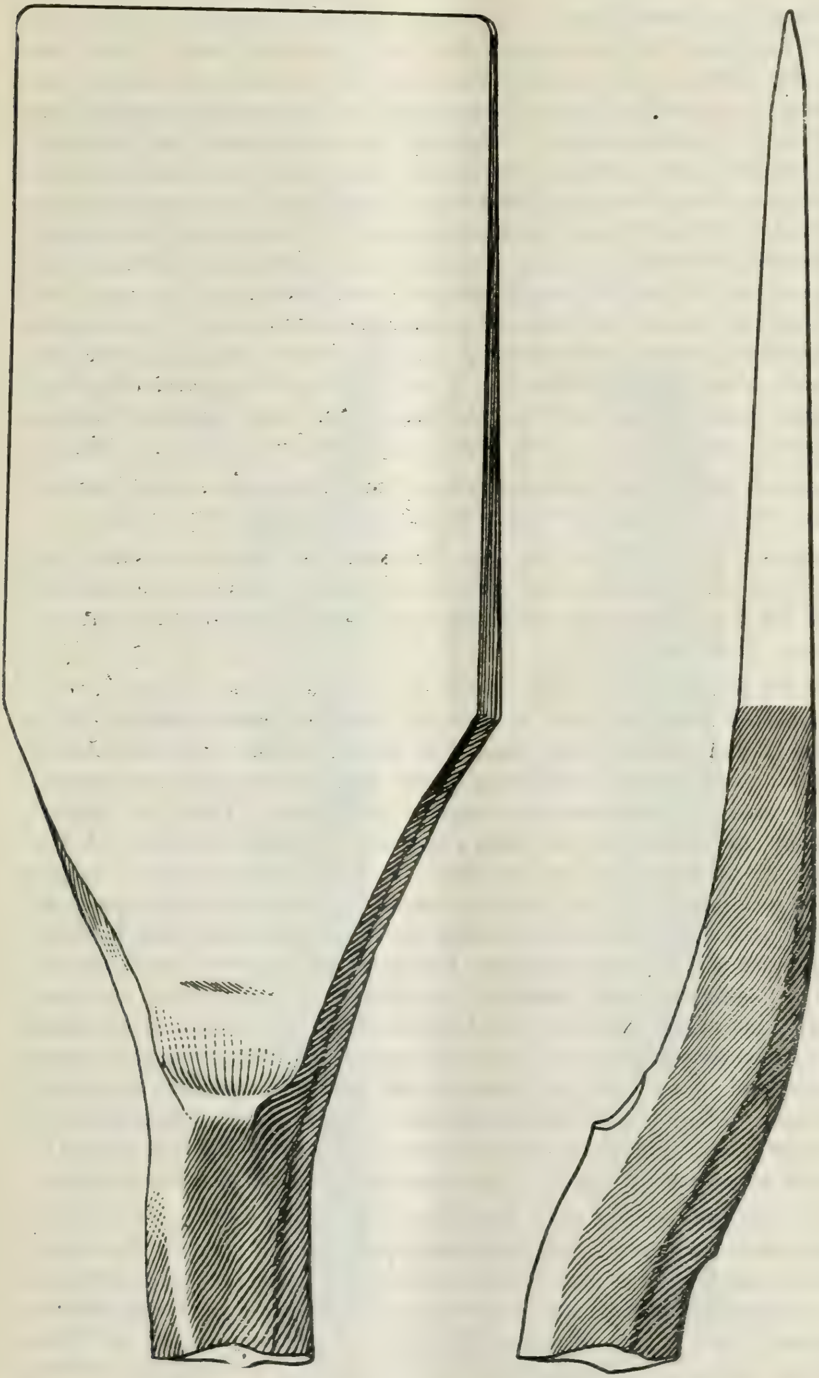


Fig. 4.—Front and side view of wide chisel end of Cutter Bar, showing set back of blade in side view.

LAND CLEARING BY EXPLOSIVES.

Most of the bars that I have seen in this connection have been made from solid steel from end to end, which not only adds to their cost but also to their weight. They have also been considerably longer than necessary—practically fencing bars—which are too long for usefulness and too heavy for continuous work. Quite the best way to make this implement is to have the centre portion, between the two working ends, made of a piece of ordinary 1-inch black iron piping 3 feet 6 inches long, the external diameter of which would be 1¼ inches (galvanized piping will interfere with the welding of the steel terminals). A piece of ⅞-inch steel, 6 inches long, is then welded into each end of this pipe length, one piece being drawn out to a cutter bar, 3 inches wide, ground on the inside only and set back an inch or so as shown in the accompanying illustration (Fig. 4). The piece of steel at the other end is made as an ordinary chisel bar, 1 inch wide and sharpened cold-chisel fashion; besides being useful for grubbing charge holes, small and medium roots may easily be cut, if met with during grubbing operations. (Fig. 5.)

Tamping stick.—This must always be of timber, about an inch in diameter, and an old broom-handle about 5 feet long makes a most efficient one.

Crimping pliers.—These are used for fixing the detonators on to the safety fuse and cutting it into convenient lengths. Some people use their teeth, but it is most unwise and should not be encouraged under any circumstances. (See Figs. 6 to 10.)

Electric firing battery.—This is used only where several charges have to be exploded simultaneously, as there is no other reliable method. It is mostly, if not entirely, used when it is desired to blow trees and stumps right out of the ground. This firing battery is in no sense a chemical battery, but is similar in operation to a magneto or dynamo. There are different types on the market, varying from a capacity of a single shot, for coal-mine work, up to fifty shots at one time; in style they also differ, ranging from the ordinary Q type, where a handle is revolved at a high speed and at the same time a button pressed to break the current and flood the circuit with a full, fat spark, to the Rackbar type, where a long handle-bar with a fine-toothed rack attached, is pushed down briskly and a cut-out plate struck at the bottom to flood the circuit. This scheme of liberating the current generated at the very last moment is to ensure that the whole amount will speed round the circuit in one energetic mass and so provide sufficient to fire all the charges concerned; otherwise the firing would be irregular and some charges would be unexploded. The Rackbar type is by far the better machine, and a 10-shot capacity is the most convenient size.

The Galvanometer is a very weak, chemical dry-cell battery, and is only useful for testing the electric detonators before inserting them in the various charges, and then after connecting up these charges in series and coupling up to the firing cable, to make sure that all connections are secure and no "shorts" exist. With care these dry cells will last for months, and when they run down they can be renewed for a few shillings. It would be extremely

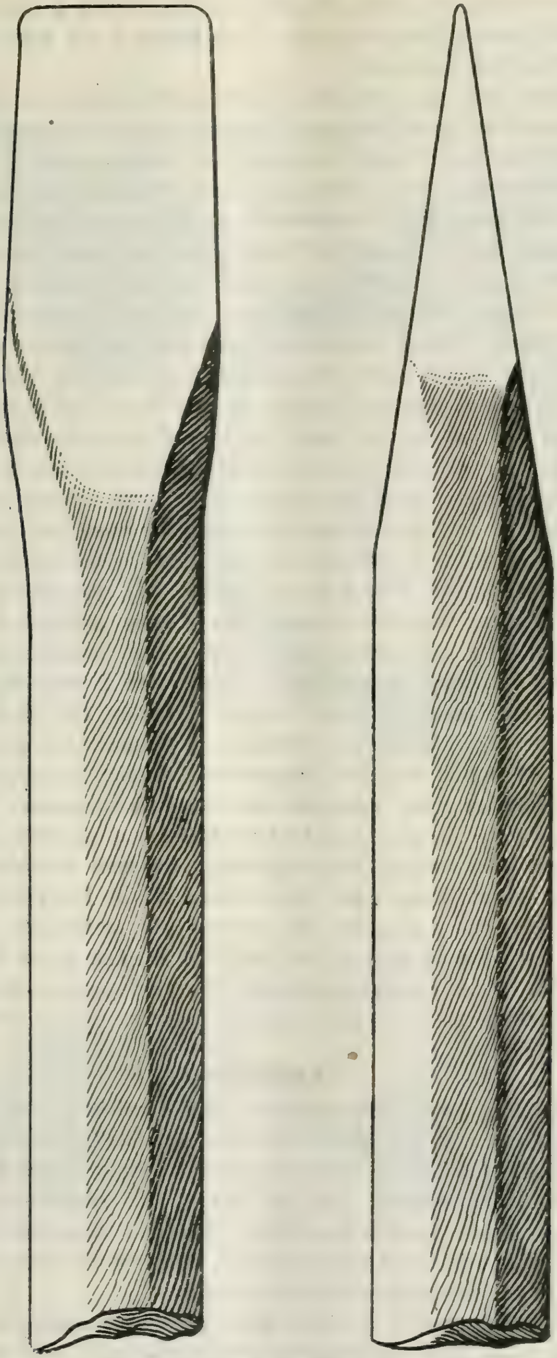


Fig. 5.—Front and side view of narrow chisel end of Cutter Bar.

LAND CLEARING BY EXPLOSIVES.

risky for anyone who is not throroughly conversant with galvanometer testing to attempt to renew these dry cells. Too strong a cell would explode and not test the electric detonator.

The Firing Cable is, or should be, 100 yards long and composed of two wires or strands of wires, separately insulated and waterproofed to prevent "shorting," and then further insulated and waterproofed to prevent damp or wet penetrating them. They are highly flexible, and should be quite moisture-proof under all circumstances; with care they will last for years.

No. 6 *Detonators* (ordinary).—These consist of small copper cylinders, about ¼ inch diameter, open at one end only, and charged with about 16 grains of fulminate of mercury, a very sensitive compound with a high detonating force. Their function is to explode the charges of gelignite by detonation, and they should be handled with all care and respect, since their explosive force is in the neighbourhood of 60 lb. per square inch, which is more than sufficient to blow one's hand off, if not used carefully.

No. 6 *Detonators* (Electric or E.D. fuses).—These are similar to the ordinary No. 6 detonators as to the copper cylinder and charge of fulminate of mercury, but they have an addition to enable them to be fired electrically instead of by ordinary safety fuse. Attached to each electric detonator are two wires, and on one end of each wire is a small metal pole, one slightly shorter than the other. Uniting the ends of these poles of varying length is an extremely fine platinum wire, over which fits a gun-cotton priming, very similar in appearance to a fusee match head. This priming rests right up against the fulminate of mercury in the copper cylinder, the whole attachment being kept firmly in place by a waterproofed insulation compound on its open end, performing the dual purpose of keeping the contrivance in its place and preventing any moisture reaching the fulminate. In operation, the spark generated in the firing battery flies down one wire and across the fine platinum wire bridge, which instantly becomes incandescent, just as an ordinary electric lamp does, thus setting fire to the gun-cotton priming which explodes the fulminate of mercury and detonates the charge of gelignite. The current having completed its function in the first E.D. fuse, rushes up the other wire and along to the next fuse, repeating the same operation, up to number of charges in the circuit or the capacity of the firing battery.

Explosives.

There are many kinds of explosives on the market, most of which are applicable to the varying work of land clearing. Gelignite, dynamite, rack-a-rock, and black powder are the most generally known and distributed, and are therefore comparatively easy to obtain; in normal times most of the agents for explosives handle the above. They all have their advocates and will all do good work; but the conditions under which some will and some will not, make it essential to explain in detail.

Gelignite and dynamite are both nitro-glycerine compounds, and for land clearing purposes they practically do the same work, but there is a vast

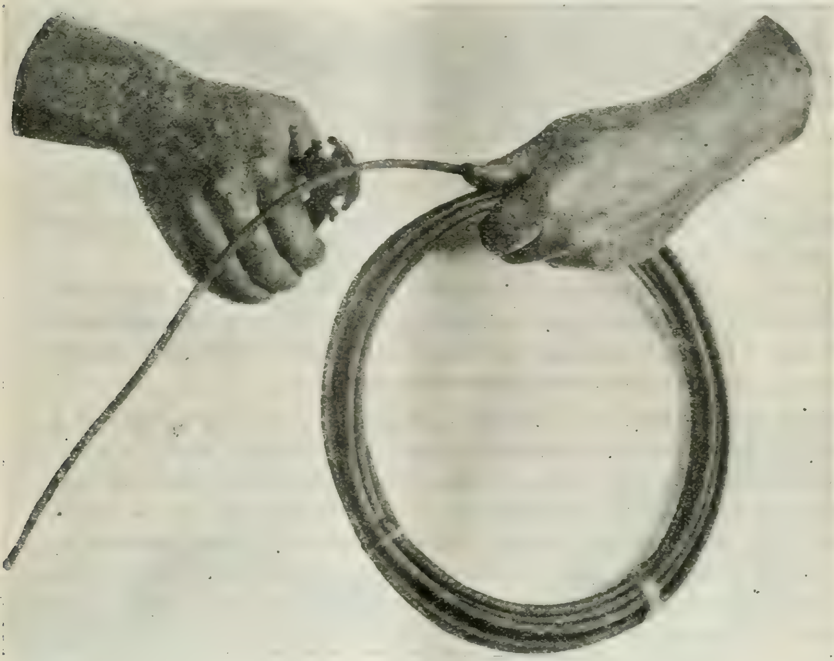


Fig. 6.—Cutting the required length of fuse.

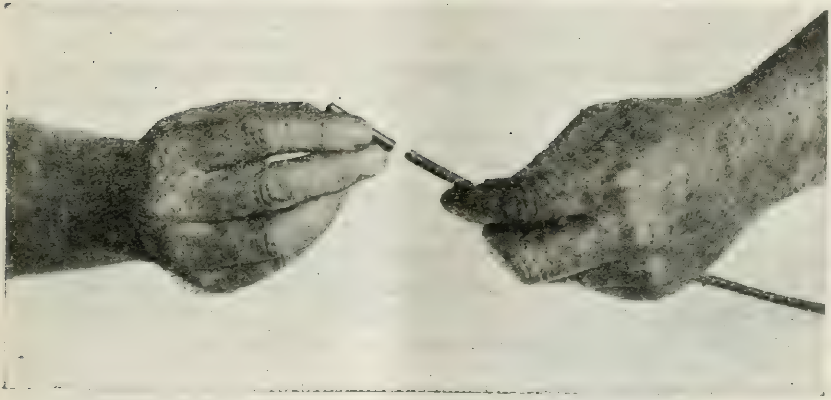


Fig. 7.—Inserting the fuse in the detonator.

LAND CLEARING BY EXPLOSIVES.

difference in their character and method of manufacture, which stands out in favour of one to the exclusion of the other, for the farmer who is not necessarily an expert with explosives.

Dynamite is a mechanical mixture and soluble in water, that is to say, the nitro-glycerine, being only absorbed or taken up in a containing earth, separates out from that containing earth on coming in contact with water, and this crude form of nitro-glycerine is highly sensitive to friction, even when a wooden tamping stick is in use. It is highly dangerous for the reason that the farmer may frequently be working in wet ground when clearing, and the above conditions would operate. Many serious fatalities have been attributed to this solubility of dynamite.

Gelignite is a definite chemical compound, being nitro-glycerine gelatinised chemically and mixed with certain other ingredients. It is quite insoluble in water, and if left in it for long periods would certainly deteriorate, but its chemically combined parts would never separate.

Both of these explosives—dynamite and gelignite—will burn freely if a match is applied, and in the open air in such a condition would be comparatively harmless; but if thrown into a hot confined fire, where air had very little access, such as a stove fire, or a fierce burning log, serious results are likely, for the reason that as the explosive burns, the gases produced by the chemical change are generated very rapidly, and not being able to get away they form a pressure about themselves, which explodes them—really spontaneous combustion.

Rack-a-rock is a combination of two chemicals, one a solid and the other a liquid, neither being classed as an explosive separately but becoming so when they are brought together as rack-a-rock. The solid section consists of a 98 per cent. chlorate of potash cartridge, packed in small calico bags of sausage shape and varying diameter. The liquid is an oil known generally as Murbane or Almond oil, and chemically as nitrate of benzole, and by soaking the chlorate of potash cartridge in the murbane oil for about three minutes, it becomes a powerful explosive. It is somewhat slower in its explosive action than nitro-glycerine compounds, as used in this State, and for that reason it is well adapted to the work of land clearing; but it is of very little use in wet holes or wet ground, not for the same reason as dynamite but because water apparently breaks up the chemical combination of the chlorate of potash and the murbane oil, rendering it inoperative. All the foregoing—gelignite, dynamite, and rack-a-rock—are exploded by detonation through a No. 6 detonator, and not through the ordinary fuse by itself, though it is good practice to use half a plug of gelignite in addition, as a primer, when firing rack-a-rock, as I have frequently found that a No. 6 detonator is apparently not strong enough to be absolutely certain.

Black powder is a proportional mechanical mixture of three substances—nitre, sulphur and charcoal—not so strong in explosive force as any of the foregoing, and very much slower in its action. Its slow pushing action is

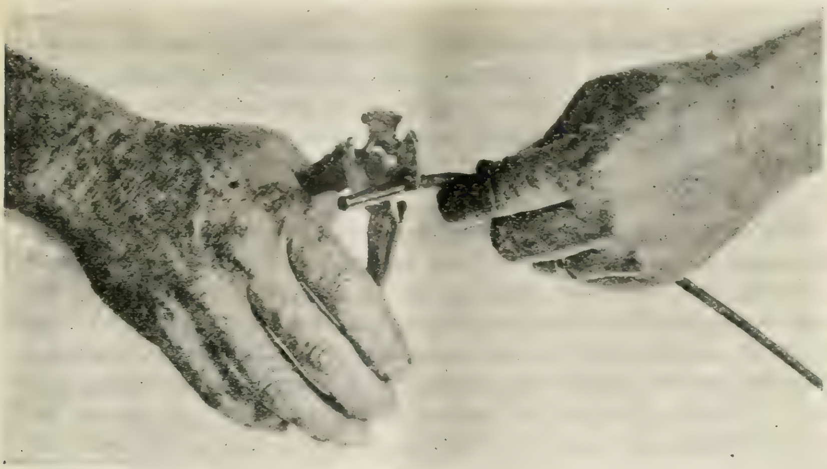


Fig. 8.—Crimping the cap on the fuse.

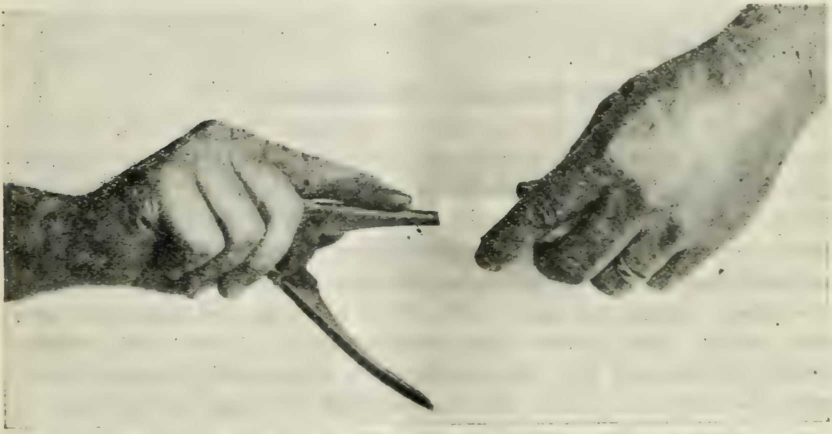


Fig. 9.—Punching a hole in the plug of gelignite, showing the correct position of the hands and gelignite when making the hole with crimpers.

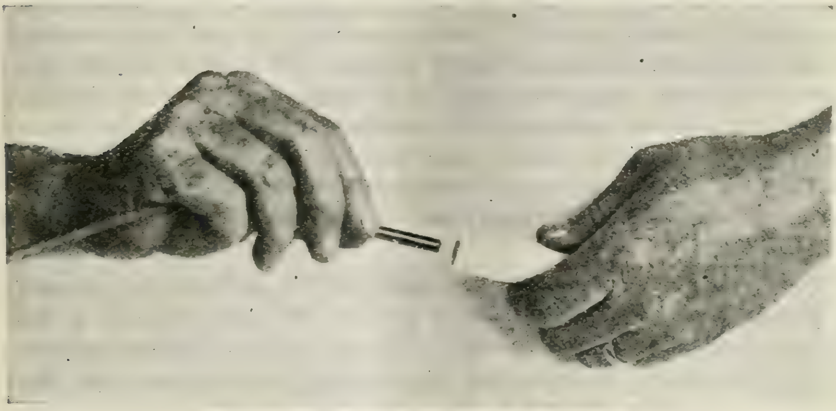


Fig. 10.—Inserting the capped fuse in the gelignite.

LAND CLEARING BY EXPLOSIVES.

ideal for work in the soils, but the lack of explosive force throws black powder out when handling trees and stumps; it is used extensively for log splitting in the sleeper-cutting and timber business, as its slow action does not shatter and destroy the logs like the more rapid gelignite and dynamite do. Black powder is exploded by fire and not by detonation, and the ordinary safety fuse is used for this purpose.

Safety fuse is the ordinary powder fuse, used for firing blasting powder, and attached to a detonator for firing gelignite, dynamite and rack-a-rock. It consists of a continuous core of powder through the centre of an inflammable and practically waterproofed wrapper, is made with great skill and very little variation, and is tested carefully by the Explosives Department, having to answer certain rigid requirements before it is permitted to be placed on sale. The rate of burning is about 2 feet per minute, and for land-clearing purposes, where charges are usually fired shortly after they are tamped, it is quite waterproof. There are several makes on the market, the double tape being pre-eminently the best, but of unnecessarily high quality and price for land-clearing purposes, where a cheaper article, such as "blue sump," is quite as effective.

Why Gelignite is Recommended.

All the foregoing explosives have their adherents, and justly so, but the Department of Agriculture recommends gelignite as the safest in the hands of the farmer, who is not necessarily an explosive specialist. Gelignite is all ready prepared in convenient cartridge or plug form, will stand a considerable amount of rough handling, is not affected by water, and can probably be purchased more generally than any of the other explosives. It is somewhat too suddenly strong and rapid in its effect, however, and appears to give better service when slowed down mechanically. In very cold weather gelignite, in common with all nitro-glycerine compounds, becomes frozen, getting as hard as a board. In this condition it should not be used, on account of its liability to miss fire and, curious though it may appear, of its greater sensitiveness to friction. Its susceptibility to explosion in this frozen condition is due, experts tell us, to the rubbing together of the frozen ice crystals of nitro-glycerine. Proper warming pans are on the market for the purpose of thawing out frozen gelignite, but a simple and effective way is to place the plugs or cartridges in an ordinary tin billy, and to stand this billy in a bucket containing hot water—so hot that you can just about bear your hand in it—for about twenty minutes, when it becomes soft and pliable. On no account should the bucket containing the hot water and frozen explosive be put on or near a fire; such a proceeding would be highly dangerous.

When gelignite was originally recommended for land-clearing purposes in pre-war days, it contained about 62 per cent. nitro-glycerine, but as the war period extended and the demand for nitro-glycerine for military purposes became more acute, the percentage was reduced to 50 per cent., and this is the form in which it is now being received in New South Wales. From observation I am of the opinion that for clearing purposes this 50 per cent. nitro-glycerine product is more satisfactory than the old 62 per cent. form, owing to the reduced percentage of nitro-glycerine giving a much slower effect. It makes one wonder whether, if a 30 per cent. gelignite—not dynamite—could be obtained, proportionately better results could not be looked for. The 30 per cent. product should also be much cheaper, and this would all tend to popularise the system of clearing with explosives. In America, probably the home of the system, a lower grade explosive is always obtainable in the form of dynamite, for it is recognised that the higher grades are not only too severe and quick in their action, but also too costly, a feature that does not make for the more general use of explosives for the purpose.

In splitting logs for commercial uses—sleepers for instance—the gelignite obtainable here is too fast, and does too much shattering and splintering in the vicinity of the charge to be profitable, and black powder is therefore used. This old explosive has the ideal action—slow and forcefully pushing—for timber splitting, and does not destroy much in the neighbourhood of the explosion, but the difficulty with it, especially in dealing with a large log, is to get a sufficient charge in unless a 2½-inch auger hole is bored, and that is a hole that takes some boring. Were a 30 per cent. gelignite available it should be ideal for splitting for all purposes, as well as for land clearing generally, and it would require nothing out of the way in the matter of auger holes, say from 1 inch to 1½ inches.

(*To be continued.*)

SOWING LUCERNE ON THE BLACK SOIL PLAINS.

A CORRESPONDENT asks for the best methods of producing a satisfactory stand of lucerne on the black soil plains, where artesian water is available.

In reply, Mr. A. H. E. McDonald, Chief Inspector of Agriculture, states that at Coonamble Experiment Farm irrigation by means of artesian water is conducted, and this problem has been solved by applying water after the seed is sown. Levels are first taken to ascertain how the land falls, and in that district as in most other areas in the artesian basin it has been found that generally there is a fall of about an inch to the chain to the north-west. In most cases, however, the land can be laid out with the flow to west-north-west or north, as it has been found that a suitable fall can be secured in any of these directions. At Coonamble the land is set out for irrigation, so that the water flows over the irrigation area in a direction west of north-west.

The land has so even a fall that generally no grading is required, and all that is necessary to prepare it for irrigation is smoothing, and large areas can be covered daily. Before seeding takes place the soil must be reduced to a fine condition, but no difficulty is experienced in this, as although this class of land when ploughed breaks up in great clods, a few months' weathering causes it to work down to a fine tilth.

The seed is sown by means of a wheat-drill, through the grass seeder attachment, with the tubes out of the hoes or discs, as the case may be, so that it falls on the surface. A light pole drawn behind the drill covers the seed sufficiently. If a drill is not available, the seed may be sown broadcast by hand, or one of the small hand broadcasters. Harrowing should not be done on any account after sowing, as the seed will be covered too deeply.

Immediately after sowing, shallow furrows, about 5 feet apart, should be made for irrigating. At Coonamble these furrows are made by a shovel attachment to a cultivator. All the ordinary tines are taken off a 5-foot cultivator, except one in the centre, to which the shovel is attached. This shovel is about 9 inches wide, and is set to make a furrow about 4 inches deep, and about 5 feet apart. The water is led out of the head channel into a subsidiary channel, and the irrigating furrows are connected up to this. It has been found that owing to the nature of the black soil, water, when flowing slowly along these shallow furrows, will gradually percolate through until it meets, and all the soil becomes thoroughly moistened to the surface without being flooded. To secure the best results, the water should not be allowed to flow too freely, and when irrigating in this way the area should be carefully regulated to the head of water available. If the water flows too freely the soil will not be thoroughly moistened, and in some cases it may be necessary to check it for a time in the furrows by throwing in earth. If on the other hand the water should break over the furrow, and flood the surface, the land will become hard, and the young plants will not break through.

Under ordinary circumstances, *i.e.*, when the seed is sown and the land is dry, and rain is depended upon to produce germination, very disappointing results are obtained owing to the silting of the surface, while if the seed is sown after rain, or irrigating, the stand is even worse; but by following the above method, extraordinarily good results have been obtained at Coonamble, as many as ninety plants having been counted to the square foot, where 10 lb. of seed have been sown per acre, and very few plants have died.

It has been found that the best time to sow is in April or May, but good stands have been obtained from June and July sowings, and also from September sowings.

Rain is very detrimental if it falls between the time of irrigating and the appearance of the plants (generally about ten days), as it sets the surface. Dry periods should therefore always be selected for sowing.

Sheep and Wool for Farmers.

CROSS-BREEDING EXPERIMENTS.

THE WOOL AND MUTTON TYPE.

[Continued from page 110.]

J. WRENFORD MATHEWS.

Bathurst Experiment Farm and Combined Results—*contd.*

The Ewes.

SIMILAR information has also been recorded in respect of the ewes. With the exception of body measurement (which, as already mentioned, varies with breeding ewes) precisely the same method of recording the development of the sheep was adopted as in the case of the wethers. The returns from Bathurst Experiment Farm are given first, and thereafter the averages for each of the three farms separately. The following table distinguishes between the ages, and gives body and fleece weights for each year individually.

TABLE VIII.—Average Body and Fleece Weights of Ewes at Bathurst Experiment Farm.

L_1M.					L_2M.					L_3M.				
	Weights.					Weights.					Weights.			
No.	Body.		Fleece.		No.	Body.		Fleece.		No.	Body.		Fleece.	
1 year 4 months.						Year 1912.					Shorn 1st November.			
	lb.	oz.	lb.	oz.		lb.	oz.	lb.	oz.		lb.	oz.	lb.	oz.
12	75	14	8	5	10	77	0	8	4	17	90	13	8	8
1 year 4 months.						Year 1913.					Shorn 28th October.			
10	103	8	12	2	8	96	4	12	3	12	110	12	11	4
2 years 4 months.														
9	104	0	12	4	10	104	12	11	6	17	126	4	12	2
1 year 4 months.						Year 1914.					Shorn 26th October.			
25	91	8	11	5	19	91	3	11	5	17	104	6	10	13
2 years 4 months.														
9	97	4	11	2	8	86	6	10	12	12	103	0	10	1
3 years 4 months.														
9	100	7	10	13	9	92	10	10	10	17	122	12	10	6
1 year 4 months.						Year 1915.					Shorn 22nd October.			
17	99	0	10	15	21	105	2	11	5	18	118	10	10	4
2 years 4 months.														
25	108	4	11	5	19	110	11	11	5	14	130	8	10	4
3 years 4 months.														
9	119	10	11	2	8	114	12	10	10	10	135	11	9	11
4 years 4 months.														
9	122	12	11	7	7	111	9	10	10	17	124	11	9	9

TABLE VIII.—Average Body and Fleece Weights of Ewes—*continued.*

L$_1$M.					L$_2$M.					L$_3$M.				
Weights.					Weights.					Weights.				
No.	Body.		Fleece.		No.	Body.		Fleece.		No.	Body.		Fleece.	
2 years 4 months.					Year 1916.					Shorn 16th October.				
17	105	11	11	3	21	104	12	10	10	18	123	0	10	4
3 years 4 months.														
23	111	13	10	14	19	108	10	10	9	14	126	0	9	12
4 years 4 months.														
8	108	14	10	11	8	102	6	10	5	10	129	0	9	14
5 years 4 months.														
9	103	1	10	9	7	102	2	9	2	17	108	7	9	1
3 years 4 months.					Year 1917.					Shorn 25th October.				
17	119	2	11	3	21	102	8	11	0	18	122	2	10	4
4 years 4 months.														
19	119	8	10	6	16	96	2	9	5	14	114	0	10	1
5 years 4 months.														
8	105	9	10	0	8	95	0	9	5	10	132	1	8	9
6 years 4 months.														
9	105	9	9	8	7	103	0	9	7	17	106	6	8	9
4 years 4 months.					Year 1918.					Shorn 20th October.				
17	117	2	11	2	21	101	6	11	1	17	117	1	10	5
5 years 4 months.														
19	105	9	10	5	16	106	0	10	7	11	114	8	9	1
6 years 4 months.														
8	103	6	9	6	7	85	4	7	7	8	124	2	8	6
7 years 4 months.														
7	100	8	10	2	7	99	8	8	9	15	105	2	8	6

The extent to which these results were affected by the seasons may be gauged by a perusal of the report that appeared in the *Gazette* in July last, where the conditions prevailing were described. From the year 1914, the seasons in the Bathurst district may be regarded as normal, although the rainfall in 1916 was higher than that of the other three.

In comparing the figures furnished for these ewes, it should be borne in mind that at every age, except 1 year 4 months, they reared lambs. The rams were joined with them during January and February, when they were about 1 year 7 months old. During certain years, and at varying ages, some groups had a higher percentage of lambs than others; and although that would make a slight difference in the weight of body and fleece, it is not thought necessary at this stage to individualise. That aspect of the work can well be left till the second phase of the investigations—the raising of the export lamb—is reviewed. The average increase, however, was approximately 75 per cent., and as this percentage was spread over the full period, and among the different groups, the results now under notice could not be materially affected by more ewes remaining dry in one group than in another. The averages may, therefore, be accepted as accurate enough for ordinary purposes. But for the fact that they include ages up to 7 years 4 months, the figures for the ewes are set out in the same form as was done with the wethers.

Table IX.—Showing Average Body and Fleece Weights of Ewes of various breeds at each year.

Cross.	Years Recorded.	No. of Sheep.	Weights.			
			Body.		Fleece.	
1 year 4 months.						
			lb.	oz.	lb.	oz.
L_1M	4	64	92	5	10	12
L_2M	4	58	94	7	10	14
L_3M	4	64	105	15	10	2
2 years 4 months.						
L_1M	4	60	105	3	11	6
L_2M	4	58	104	2	11	0
L_3M	4	61	121	11	10	11
3 years 4 months.						
L_1M	4	58	113	6	11	0
L_2M	4	57	104	11	10	11
L_3M	4	59	125	8	10	1
4 years 4 months.						
L_1M	4	53	117	11	10	13
L_2M	4	52	101	4	10	5
L_3M	4	58	120	10	9	15
5 years 4 months.						
L_1M	3	36	104	15	10	4
L_2M	3	31	102	4	9	13
L_3M	3	38	116	6	8	14
6 years 4 months.						
L_1M	2	17	104	8	9	8
L_2M	2	14	94	2	8	7
L_3M	2	25	112	1	8	8
7 years 4 months.						
L_1M	1	7	100	8	10	2
L_2M	1	7	99	8	8	9
L_3M	1	15	105	2	8	6

The returns are again quite consistent with those of the wethers, except that the differences between the Lincoln and Border Leicester crosses are not so great, and the Leicester crosses appear to slightly better advantage, although still behind the other two. The Border Leicester cross again reaches its highest point of development at the age of 3 years 5 months. Beyond that age the Lincoln cross is gradually improving its position, but the substantial gain which the Border Leicester establishes in the early stages stands it in good stead ; and even at the advanced age of 7 years 4 months it still holds the advantage over the Lincoln to the extent of 4 lb. 10 oz. The surprising feature of these results is the manner in which the Border Leicester crosses have maintained their weight of fleece. It was fully anticipated that the

Lincoln crosses would have shown a material gain in this respect as they grew older, but at no stage did the advantage in this respect exceed 1¾ lb., and this was at 7 years 4 months.

At 1 year 4 months the Border Leicester has the advantage in body weight of 13 lb. 10 oz., at 2 years 4 months 16 lb. 7 oz., at 3 years 4 months 12 lb. 2 oz., at 4 years 4 months 3 lb., at 5 years 4 months 11 lb. 7 oz., at 6 years 4 months 7 lb. 9 oz., and at 7 years 4 months 4 lb. 10 oz. At these same ages the Lincoln has leads of 10 oz., 11 oz., 15 oz., 14 oz., 1 lb. 6 oz., 1 lb., and 1 lb. 12 oz. respectively in fleece weight.

Still more convincing are the results when taken at the different ages for all three farms together.

The next table gives these records in condensed form.

TABLE X.—Combined Average Weights of Longwool Crossbred Ewes of various ages:—

Ewes.		L_1M.			L_2M.			L_3M.		
Farm.	Years Recorded.	No.	Weights.		No.	Weights.		No.	Weights.	
			Body.	Fleece.		Body.	Fleece.		Body.	Fleece.
1 year 5 months.										
			lb. oz.	lb. oz.		lb. oz.	lb. oz.		lb. oz.	lb. oz.
Wagga 1911–14	4	61	79 5	10 3	86	78 14	9 10	106	87 9	9 8
Cowra 1912–15	4	105	84 11	8 3	118	82 13	7 0	81	91 7	7 4
Bathurst 1912–15	4	64	92 5	10 12	58	94 7	10 14	64	105 15	10 2
Averages ...		...	85 6·3	9 7	...	84 1·8	8 11·7	...	93 8	8 15
2 years 5 months.										
Wagga 1912–15	4	58	80 0	8 0	90	80 5	8 10	103	88 12	8 0
Cowra 1913–16	4	103	104 4	10 2	105	103 13	8 14	73	120 6	9 6
Bathurst 1913–16	4	60	105 11	11 6	58	104 2	11 0	61	121 11	10 11
Averages ...		...	98 2·9	9 14·8	...	95 9	9 4·4	..	107 0	9 2·5
3 years 5 months.										
			lb. oz.	lb. oz.		lb. oz.	lb. oz.		lb. oz.	lb. oz.
Wagga 1913–16	4	57	102 4	11 2	71	94 12	8 10	103	103 4	9 5
Cowra 1914–17	4	103	106 7	10 2	111	105 7	9 0	72	110 9	8 12
Bathurst 1914–17	4	58	113 6	11 0	57	104 11	10 11	59	125 8	10 1
Averages ...		...	107 3·2	10 10·4	...	102 1·8	9 5·3	...	111 2·4	9 5·6
4 years 5 months.										
Wagga 1914–17	4	56	96 5	9 9	68	101 10	8 5	95	106 14	8 8
Cowra 1915–18	4	98	105 14	9 15	111	101 11	8 14	73	112 8	8 10
Bathurst 1915–18	4	53	117 11	10 13	52	101 4	10 5	58	120 10	9 15
Averages ...		...	106 5·4	10 1·2	...	101 9·5	9 1·4	...	112 3·6	8 14·8
5 years 5 months.										
Wagga 1915–18	4	47	109 13·8	8 7	64	100 7	7 10	88	108 3	8 2
Cowra 1916–18	3	70	109 10	10 1	73	104 10	8 3	50	113 9	8 6
Bathurst 1916–18	3	36	104 15	10 4	31	102 4	9 13	38	116 6	8 14
Averages ...		...	108 9·6	9 10 3	...	102 9·3	8 5	...	111 8·3	8 7

TABLE X.—Combined Average Weights of Longwood Crossbred Ewes of various ages—*continued.*

Ewes.		L_1M.			L_2M.			L_3M.		
Farm.	Years Recorded.	No.	Weights.		No.	Weights.		No.	Weights.	
			Body.	Fleece.		Body.	Fleece.		Body.	Fleece.
			6 years 5 months.							
			lb. oz.	lb. oz.		lb oz.	lb. oz.		lb. oz.	lb. oz.
Wagga 1916-18	3	25	109 6	9 3	41	104 12	6 15	61	108 3	8 5
Cowra 1917-18	2	46	101 10	9 11	52	96 6	7 9	31	101 0	8 10
Bathurst 1917-18	2	17	104 8	9 8	14	94 2	8 7	25	112 1	8 8
Averages ...		..	104 6·5	9 8·1	...	99 5	7 6·8	...	107 2·1	8 7·3
			7 years 5 months.							
Wagga 1917-18	2	22	104 9	7 0	23	97 0	6 3	37	107 11	7 6
Cowra 1918	1	24	110 2	9 8	30	104 14	7 4	22	116 5	7 15
Batburst 1918	1	7	110 8	10 2	7	99 8	8 9	15	105 2	8 6
Averages ...		...	106 8 6	8 9	...	101 3·4	7 0	...	109 11·7	7 11·7
			8 years 5 months.							
Wagga 1918	1	9	110 1	7 2	6	97 0	7 0	18	115 7	6 2

Again we find the Lincoln groups in advance of the Leicester lots at practically all ages, both in body and fleece weights, while the Border Leicester crosses are still to the fore in respect of the former, and are holding their own in competition with the Leicester crosses with regard to the latter.

A comparison may first be made between the Lincoln and Leicester crosses. At 1 year 5 months the former heads the latter by 1 lb. 5·2 oz., at 2 years 5 months by 2 lb. 9·9 oz., at 3 years 5 months by 5 lb. 2·2 oz., at 4 years 5 months by 4 lb. 12 oz., at 5 years 5 months by 6 lb. 0·3 oz., at 6 years 5 months by 6 lb. 1·5 oz., at 7 years 5 months by 5 lb. 5·2 oz., and at 8 years 5 months by 3 lb. 1 oz.

The Border Leicester heads the Lincoln by 12 lb. 1·7 oz. at 1 year 5 months, by 8 lb. 13·9 oz. at 2 years 5 months, by 3 lb. 14·8 oz. at 3 years 5 months, by 5 lb. 14·2 oz. at 4 years 5 months, by 2 lb. 15 oz. at 5 years 5 months, by 2 lb. 12 oz. at 6 years 5 months, by 3 lb. 3·1 oz. at 7 years 5 months, and by 5 lb. 6 oz. at 8 years 5 months.

At the corresponding ages the wool weight in favour of the Lincoln as compared with the Border Leicester is at 1 year 5 months 8 oz., at 2 years 5 months 12·8 oz., at 3 years 5 months 1 lb. 5 oz., at 4 years 5 months 1 lb. 2·9 oz., at 5 years 5 months 1 lb. 3·3 oz., at 6 years 5 months 1 lb. 1 oz., at 7 years 5 months 13·9 oz., and at 8 years 5 months 1 lb.

The Border Leicester asserts its superiority in the earlier stages, but as the sheep settle down to breeding and as they get older the difference is not so great. Still, despite its early maturity and natural disposition to earlier decline, it is remarkable to note how the Border Leicester retains both body and fleece weights, even up to the 8 years 5 months' stage, when they have an advantage of 5 lb. 6 oz. in body weight, and are only 1 lb. behind the Lincoln in wool.

Type of Merino Ewes utilised in the cross-breeding experiments.

TABLE XI.—Showing gain in Body and Fleece Weights of Ewes from year to year.

Ages.	L_1M.		L_2M.		L_3M.	
	Body.	Fleece.	Body.	Fleece.	Body.	Fleece.
	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
From 1 yr. 5 mths To 2 ,, 5 ,,	12 11·8	0 7·8	11 7·9	0 9·3	13 8	0 3·5
From 2 ,, 5 ,, To 3 ,, 5 ,,	9 0·1	0 11·2	6 8·8	0 0·9	4 2·4	0 3·1
From 3 ,, 5 ,, To 4 ,, 5 ,,	0 14·2*	0 9·2*	0 8·3*	0 4·3*	1 1·2	0 0·7*
From 4 ,, 5 ,, To 5 ,, 5 ,,	2 4·2	0 7·0*	1 0	0 12·4*	0 11·3*	0 7·0*
From 5 ,, 5 ,, To 6 ,, 5 ,,	4 3·1*	0 2·2*	2 12·3*	0 14·9*	4 6·3*	......
From 6 ,, 5 ,, To 7 ,, 5 ,,	2 2·1	0 1·51*	1 13·4	0 6·5*	2 9·7	0 11·9*
From 7 ,, 5 ,, To 8 ,, 5 ,,	3 5·9	1 7·0*	4 3·4*	......	6 11·9	1 9·7*

* In these cases losses, not gains, were recorded.

It should be remembered that the period from 7 years 5 months to 8 years 5 months includes the results from only one group of ewes—those located at Wagga Experiment Farm. They are, therefore, hardly fair subjects for comparison. Otherwise the figures may be accepted as a fair criterion of the rate at which development might take place, or at which they might decline as the ewes advance with age. It is to be noted that the Lincoln cross maintains a steady gain almost throughout, while both the others tend to recede earlier. The loss of fleece commences soon after the 2 years 5 months' stage in practically all cases, as might be expected, considering it is at about this age the ewes come into breeding condition.

It will next be interesting to see how these results work out in actual values, both for carcase and wool. That branch of inquiry will be the subject of another article, in which the variation in quality and the clean yield value of the wool will be shown.

(*To be continued.*)

Dispersal Sale of Pure-bred Holstein Cattle, Berry Experiment Farm.

The whole of the fine stock of Holstein cattle at the Government Experiment Farm, Berry, will be sold by public auction on the Farm on Wednesday, 9th April, 1919, at 1·30 p.m., by Messrs. Wm. Inglis and Son, Auctioneers, 251A, Pitt-street, Sydney.

They comprise fifteen cows, twelve heifers, and thirteen bulls. In addition, six Milking Shorthorn bulls of good pedigree will be offered.

For the information of persons attending the sale, the times of trains from Sydney and return will be, as far as can be ascertained, as follows :—

	Leave Sydney.	Arrive Berry.
Tuesday, 8th April ...	4 45 p.m.	8 50 p.m.
Wednesday, 9th April ...	8 20 a.m.	12 40 p.m.

	Leave Berry.	Arrive Sydney.
Wednesday, 9th April ...	4 25 p.m.	10 20 p.m.
Thursday, 10th April ...	6 47 a.m.	11 25 a.m.

Prospective buyers wishing to inspect the stock before the sale should travel by train on 8th April.

Catalogues giving full description of pedigrees, &c., may be obtained from the Auctioneers, or from the Under Secretary and Director, Department of Agriculture, Lands Building, Bridge-street, Sydney.

Bromus japonicus AT YANCO EXPERIMENT FARM.

IN connection with the trial of this grass at Yanco, Mr. E. Furby, Experimentalist, reports that the test, which was continued through the past winter and up to December, may be regarded as very satisfactory.

The winter of 1918 was considered a dry one, and did not produce the abundance of green feed, represented by a succulent leaf growth, which characterised the previous season when the winter rains were much heavier. Nevertheless a good showing was made by the grass, which lasted well into a dry spring, and should warrant the inclusion of the grass in a winter pasture. It is certainly a winter grass, and provides quite a large amount of succulent feed, but with frequent irrigations a certain amount of green growth is available during the spring and early summer. Water must not be spared, for as soon as the ground becomes dry and hard the grass will dry off, as its shallow fibrous-rooting system does not make it a typical dry-weather plant.

The plants which have been propagated from seed, and those which have been increased by the transplantation of shoots do not exhibit any difference in habit of growth or profuseness of foliage. Both have stooled out into tussocks from 6 to 9 inches across.

This grass is a most prolific seeder, and soon spreads itself by means of its seeds over the area near where it is grown. In this respect it equals the allied variety, Prairie grass (*Bromus unioloides*). The flowering heads are carried on long, somewhat coarse stalks, which are branching and slightly drooping in habit. In many other respects the grass resembles Prairie grass, but while the latter is a summer annual, the variety under discussion is a perennial.

The seed falls from the flower heads very easily, and so makes it extremely simple to harvest. It must, however, be collected at the proper stage before becoming too dry, otherwise much seed will be lost. The seed begins to ripen about October, and continues on up to December and January.

There is a smut attacking the flowering heads in a manner similar to the way bunt attacks wheat. This is likely to do a great deal of harm to any popularity which the grass may attain. From a seed-producing point of view it may do considerable damage. The smut, which has that brown, rusty appearance of wheat smut when broken, first makes itself noticeable at the flowering period. It becomes more prominent as the seed develops, when the glumes will expand several times their normal size. All the heads on one plant do not appear to be attacked at the one time, while the disease seems to operate in patches only. A plot of the same grass, fully half a mile away, is practically free from the disease.

The seed produced late in the season, say, November and December, exhibits less evidence of attack from smut than the earlier seed, probably on account of the drier atmospheric conditions. From this it would be reasonable to suppose that were the grass kept well stocked or cut back, and only the late seed permitted to mature, the disease might be kept well in check.

Farmers' Experiment Plots.

Winter Fodders, South Coast, 1918.

R. N. MAKIN, Inspector of Agriculture.

THE undermentioned farmers co-operated with the Department in carrying out green fodder experiments during the 1918 winter season:—

J. H. Martin, Pambula.
J. Chittick, Kangaroo Valley.
L. B. Garrad, Milton.
L. Badgery, Exeter.
H. Stone, Wollongong.
The Superintendent, Boys' Farm Homes, Mittagong.

The year opened with exceptionally heavy rain in January, extending into February, and temperatures throughout the summer and autumn were mild.

As a consequence the ground seemed never to get warm enough to promote satisfactory growth; this was noted during the germination of the autumn-sown plots, which suffered also on account of the sparse rainfall at that time. As far as the plots were concerned germination was slow, yet satisfactory in other respects. Amongst farmers' crops some interesting features were noted at Albion Park and Kangaroo Valley, where oats which, under careful germination tests, proved well up to the standard, germinated very slowly and irregularly in the paddock.

Dry weather prevailed in March and continued until July, when good rains were experienced, but from that time to the end of the year drought conditions spoilt most of the crops.

The plot at Mittagong, owing to the dry and cold weather, failed to make satisfactory growth, and no record is available.

New Varieties.

Bomen, a wheat tried for the first time on the South Coast, gave promise of being useful for green feed; it is, however, later than the others tested, and is not likely to displace Thew as a green fodder variety.

Banner oats—seed of which was secured from Sir Joseph Carruthers—was under trial for green fodder purposes. It shaped very well in the early growth, growing rapidly and stooling profusely, and many farmers who inspected the plots were greatly impressed with the growth. Unfortunately, in all cases on the South Coast, rust manifested itself badly before the ears shot. As a further drawback, after the plants attained a height of about 18 inches they remained at a standstill, all other varieties of oats beating Banner badly in point of maturity. On the highlands it yielded well, but it matured very late. It is being tried for its grain-yielding capacity in the Crookwell district, a matter which will be treated in a subsequent report.

A new barley, Cowra No. 36, raised at the Cowra Experiment Farm, proved earlier in maturity than the well known Cape variety in a test at Exeter. It carries a very heavy ear, and appeared to stand dry weather conditions better than Cape. Owing to a shortage of seed, only a limited number of experiments could be arranged, most of these being for grain in order that seed may be available for the coming season, when it is hoped to test the variety on the coast. The seed supply, unfortunately, will be very limited.

The Plots.

The plots showing to best advantage were those on Mr. L. B. Garrad's farm at Milton. Here the soil is a sandy loam, being situated on a hillside. It holds the moisture well, which is due to an ample supply of humus in the ground. The plot was prepared early in the year, and the sowing made on 25th April, 1918. Florence wheat was the first crop fit to cut for green feed (3rd September, 1918). Owing to heavy wind when the crops were in ear, several plots lodged. The sections of Ruakura oats were excellent. Had not the plot of Banner oats rusted so badly it would have given the highest yield of all.

The plots at Exeter on Mr. Badgery's farm were on red basaltic soil, and were sown on 7th May, 1918. In the early stages rabbits checked the growth of the barley and some sections of wheat. The ground was prepared early in the season, and at sowing time held a fair amount of moisture. The seed and manure were sown by the wheat drill. It was on these plots that a good return was obtained from the Cowra No. 36 barley, in spite of the depredations of rabbits—but for the pest the crop would have been harvested much earlier.

At Kangaroo Valley, on Mr. James Chittick's farm, the returns are not up to those of former years. The soil here is of sandstone formation, the paddock having previously been under crops of wheat and oats. In this test Banner oats failed completely, whilst Ruakura showed to advantage against other varieties.

At Pambula, on Mr. Martin's farm, on alluvial soil formed from granite and basalt hills, the wheat plots failed entirely, whilst the oat plots gave fair returns. For many years oats have proved much more satisfactory than wheat in this locality; the situation is rather low-lying, and no doubt suits the oats. On the higher ground wheat would probably show to better advantage.

At Wollongong, on sandstone formation, on Mr. H. Stone's farm, only fair returns were obtained from oats. The sowing (13th May, 1918) was late, and the ground contained very little moisture. The dry windy weather at the time when the crops were running to ear militated against a heavy return, but in spite of this the plots attracted a considerable amount of attention, as most of the crops in the district failed completely.

Generally during the past season oat crops were heavier than wheat, although not as early. Florence, Firbank, and Thew wheats are all very useful varieties for early green feed, and mature in the order named; Thew is the most reliable of the three. Of the oats, Sunrise is the earliest variety yet tested on the plots, and has become very popular with dairy farmers. Each season the demand for seed increases, and it would well repay oat growers to plant this variety to meet the demand among the dairy farmers. In the Crookwell district the same variety is grown for hay, and spoken highly of. It has so far proved highly rust-resistant, and it is to be hoped that larger areas will be sown this season for seed purposes.

Ruakura did not resist the rust so well as formerly; indeed, some plots were very rusty. It is, however, a very good oat for green feed and for hay, and should be grown more extensively than it is at present. The area of this variety, for seed purposes, could also be increased.

Algerian yielded better than for some seasons past; the dry winter appeared to suit it. With the exception of Banner it was the last of all varieties to mature; it thus comes in well when sowing for a succession of green feed.

Manurial Test.

These winter green fodder tests often meet bad weather conditions, and the results from the manurial experiments do not always adequately reflect the benefit from manures on that account. With a low rainfall, it is generally noticed that the application of manure tends to hasten the maturity of the plants. This is the case at any time, but seems more pronounced under scanty rainfall conditions. Superphosphate is quicker in its action than bone-dust, and is strongly recommended, either alone or mixed with an equal quantity of the latter. It is not necessary to make heavy applications; where a wheat drill is available 1 cwt. per acre is ample, while when distributed broadcast a little more is required.

The cost of the fertiliser is trifling compared with the increased returns obtainable under normal conditions even in the season under review. At two centres—Pambula and Exeter—increased returns in all manured sections were obtained, as compared with the plots untreated. At Wollongong the plot treated with 1 cwt. of superphosphate failed to yield as well as that untreated, although 2 cwt. of P7 (a mixture of bone-dust and superphosphate) gave an increased return. The manures in this case were broadcasted by hand. Owing to the area of the plot being limited, no section treated with 2 cwt. of superphosphate could be sown.

General Recommendations.

In sowing winter fodder crops to obtain the best results the following conditions should be observed:—

1. Prepare the ground early.
2. Do not sow before the middle of March, as crops are liable to run into ear should a dry spell occur during April or May.
3. See that the ground is not impoverished of its plant food, and restore it when required.
4. Grow a variety of suitable crops to be available for use in succession.

TABLE I.—Showing Results of Winter Green Fodder Trials, South Coast, 1918.

Wheat.	J. H. Martin, Pambula.				J. Chittick, Kangaroo Valley.				L. B. Garrad, Milton.				L. Badgery, Exeter.				H. Stone, Wollongong.			
Wheat—	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Florence	......				4	5	2	24	13	8	2	8	7	13	3	0	......			
Firbank	......				4	7	0	16	12	1	1	20	5	16	1	0	......			
Thew	......				5	4	1	4	11	10	0	0	8	16	1	0	......			
Bomen	......				4	17	0	16	13	2	3	12	10	0	2	14	......			
Oats—																				
Sunrise	9	1	1	20	6	10	0	0	12	18	2	8	10	13	3	0	3	8	2	8
Banner	5	14	1	4	......				13	10	0	0	9	18	3	0	......			
Algerian	9	0	0	0	7	2	3	12	10	17	0	16	12	15	0	0	5	2	3	12
Ruakura	5	0	0	0	7	15	2	24	14	17	0	16	11	1	1	0	1	15	2	24
Ruakura and Field Peas ..	5	17	0	16	6	17	0	16	15	5	2	24	11	2	3	22	4	4	1	4
Ruakura and Tick Beans ..	6	2	3	12	6	12	3	12	15	1	1	20	......				4	11	1	20
Barley, Cape	......				......				......				7	6	1	0	.....			
„ Cowra No. 36.. ..	......				......				......				9	0	0	0	......			

TABLE II.—Showing Results of Manurial Test with Oats for Green Fodder, South Coast, 1918.

Manure and Amount per acre.	J. H. Martin, Pambula.				L. Badgery, Exeter.				H. Stone, Wollongong.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Superphosphate, 1 cwt.	5	0	0	0	10	19	2	0	3	8	2	8
„ 2 cwt.	5	7	0	16	12	15	0	0	....			
No manure	3	11	1	20	8	4	0	4	3	12	2	8
P7 mixture 2 cwt.	6	14	1	4	8	18	0	14	4	2	3	12
M5 „ 1½ cwt.	5	15	2	24	10	0	2	14	4	7	0	16

P7 Mixture consists of equal quantities of superphosphate and bone-dust.

M5 Mixture consists of two parts superphosphate and one part sulphate of ammonia.

GREEN FODDERS ON THE SOUTH COAST.

MR. JOHN BARNES, of Jamberoo, has been testing various crops for green fodders during the past two or three seasons, and has communicated his impressions to the Department.

Ruakura, Sunrise, and Guyra oats were sown at the same time. Ruakura rusted very badly, and does not seem to suit the Jamberoo district. Sunrise grew well, and showed no signs of rust; it was ready for cutting in fourteen weeks. Mr. Barnes recommends Guyra for the district, as on fair land in different parts of the locality it yielded better than any other variety. It did not rust to any extent, and furnished a very heavy leafy body of feed.

His experience with Algerian is that if sown early in June it comes on well, as it is essentially a spring oat.

Among the wheats, he tried Marquis with good results, it proving a good stooler. Warren is another good variety, a quick grower, and good stooler, although not as quick as Thew or Florence.

THE AUSTRALIAN CLIMATE: ITS EFFECT IN CONTROLLING SETTLEMENT.

UNDER the title of "The Australian Environment" the Commonwealth Advisory Council of Science and Industry has just published a memoir by Dr. Griffith Taylor, Physiographer in the Commonwealth Meteorological Bureau. The research has been carried out at the Bureau of Meteorology, and was recently awarded the Syme Prize by the University of Melbourne.

The frontispiece is a "Solar-Control Model"—which shows (by a sliding card crossing a map of Australia) the way in which the sun's movement determines the actual rainfall, storms, winds, temperatures and pressures in each month of the year.

A map showing where the rains are reliable and where they are erratic is as important to the settler as the more usual seasonal and annual rain maps. Perth is shown to have the most reliable, and Onslow (W.A.) the least reliable, rainfall in Australia.

The regions of uniform rainfall are also charted and determine where the but too few valuable timber forests occur. Vegetation maps correlate the areas of sand and spinifex, of mallee, grass lands, &c., with the rainfall and temperature controls.

New methods of comparing Australian climates and Australian agricultural areas with those of foreign countries are described in the chapter dealing with Climographs and Hythergraphs.

In the third part of the memoir Australia is considered in fifteen divisions. Each is illustrated by a coloured Plate showing the contours and the distribution of rainfall. Many of these contour maps have not been published previously, and will be found of value in many developmental problems.

In each division the topography, drainage, vegetation, settlement, health, the season and origin of the rains, are considered in detail and correlated.

The rain origins are considered quantitatively, and several thousand weather maps have been tabulated in the process. Nearly 100 of the maps are reproduced in the memoir.

The Northern Territory is discussed at length. Its elevation above sea level is disappointing. Its climatic analogues (*i.e.*, Mozambique, Siam, Northern Brazil, &c.) are not favourable for close white settlement. Its natural line of entry is *via* Queensland rather than from Adelaide.

The arid region of South Australia and its peculiar geological evolution is described. The Flinders Range has risen across the Tertiary rivers and dammed back the salt lakes. The undeveloped inland country is thought to have a rainfall of only 6 to 8 inches, and the Musgrave Ranges have probably but little effect on the rainfall. The Trans-Australian railway and "Goyder's (Wheat) Line" are dealt with in early sections.

In Queensland the peculiar course of the rivers—which rise in a low recent divide and flow to the sea through high ranges—is explained by relief diagrams. The special features of the Atherton Plateau (the most valuable region available for tropical settlement) are emphasised. On its eastern flank no less than 14 *feet* of rain are recorded as the average yearly record.

The New England Plateau is shown to be the largest in Australia, and the value of its waterfalls and gorges (nearly 3,000 feet deep) for hydro-electric power is indicated. The softwood scrubs on the eastern slopes still contain much valuable timber.

In the sections on New South Wales a discussion of the general irrigation problem shows that only about one acre in Australia in every thousand (requiring water) has been reclaimed. The writer is not sanguine that this proportion can ever be greatly increased.

The unique gorges of the Blue Mountains, and the long Rift Valleys around Canberra, are illustrated by relief diagrams which show that they are due to a late uplift of our Eastern Coastlands. A similar bird's-eye view of the Victorian Highlands shows that they have originated in the uneven elevation of chunks of the earth's crust. The bearing on communications is obvious.

The climate of Canberra is contrasted very favourably with that of Sydney, and shown to resemble Melbourne in its absence of muggy weather.

Two sketches show how Port Phillip, the Yarra, Goulburn, and their tributaries have evolved in a much troubled portion of the earth. Victoria is characterised by six belts of vegetation, whose distribution is determined primarily by rainfall, but also by the geology.

In Tasmania reference is made to the evidence of the Ice Age which has moulded the highlands. The resemblance between the floras of Patagonia and Tasmania is indicated; and the characteristic pines and beeches are shown to be distributed only where the rainfall exceeds 50 inches.

The work is illustrated by 183 maps and diagrams, and constitutes the first memoir published by the Advisory Council of Science and Industry. It will be supplied on application to the Secretary of the Advisory Council, 314, Albert-street, East Melbourne, on receipt of 5s. An atlas, containing the coloured contour and rainfall maps referred to above, can be supplied separately for 1s. 6d.

Popular Descriptions of Grasses.

[Continued from page 86.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE WEEDY PANIC GRASSES.

THERE are three Panic grasses which are so vigorous and aggressive in their habits of growth that they are likely to become pests on cultivated lands. They are Summer grass (*Panicum sanguinale*), and the Swamp or Barnyard grasses (*Panicum colonum* and *P. crusgalli*).

SUMMER GRASS (*Panicum sanguinale*). (Fig. 1.)

This is well named Summer grass, as it is most conspicuous during the hottest days of summer. It is characterised by a rapidly creeping habit, by a flattened seed, and by leaves of a particular dark green shade.

Summer grass is confined mostly to the coastal districts. The winters on the tablelands are too long, and the seasons in the west too dry for its best development. It is probably the worst source of annoyance to the horticultural gardener, both large and small, in the county of Cumberland, while it becomes so vigorous and produces such a dense growth on the Northern Rivers that it is extremely difficult to combat it. The evils of Summer grass are aggravated by the fact that in spite of constant cutting or cultivating, the least bit left in the ground will soon reach a good sized plant again, the vitality of the " runners " being somewhat remarkable. Nor is it affected by hard ground, or by trampling. If it succeeds in getting established in lawns, all the mowing and trampling that can possibly be given will not be sufficient to eradicate it. Many lucerne, maize, sorghum and other crops have failed in coastal districts, owing to the rapid, vigorous growth of Summer grass.

Experience in other countries.—Summer grass is a constant source of annoyance in most temperate and sub-tropical countries. Particularly is this the case in the United States of America, where it is known as Crab grass. Frequent reference to it is found in American publications. An Ohio bulletin states : " To one who cares for a large, much-trodden lawn or a tasty garden, crab grass makes good midsummer rains almost a burden ; following these showers it springs up in nearly all early grass tracts, in gardens, meadows and cultivated fields. Its stems strike root where they touch the earth, and most careful labour is required to clean it out."

Summer grass in the United States is particularly troublesome in the grain fields, particularly in maize crops, as in this State. It also occurs abundantly in paddocks after the cereal crops have been removed, and is then utilised as

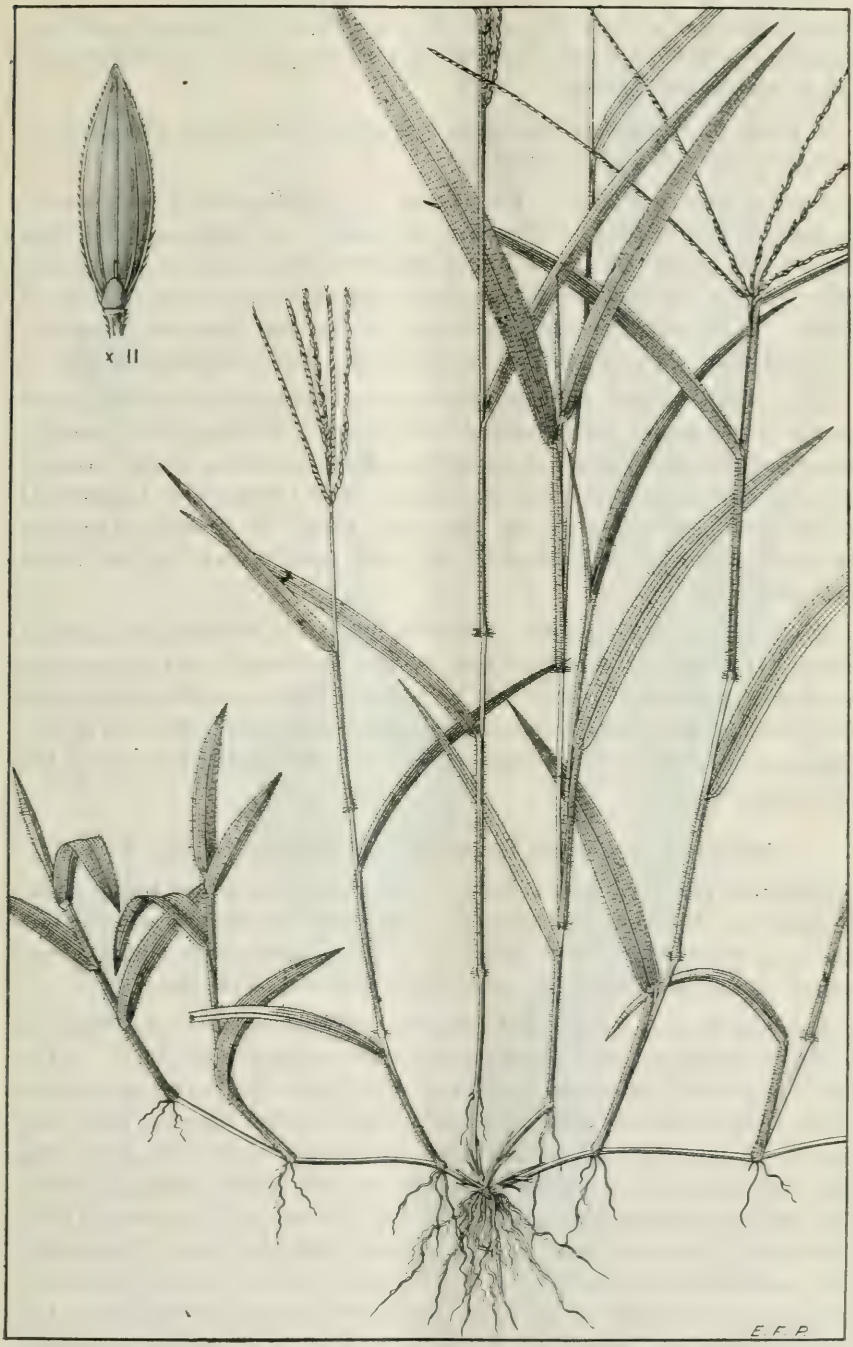


Fig 1.—Summer Grass (*Panicum sanguinale*).
Note the fibrous root system, and roots at nodes, which encourage stooling and "running" respectively.

Popular Descriptions of Grasses.

pasture, and also as hay. The grass dries quickly after being cut, and then produces excellent hay, but if the grass is wetted by rains or dew its value as hay is practically destroyed.

In Bohemia, Summer or Crab grass is grown on sandy soils, and the grain is used as a sort of mush or porridge.

Summer grass as a fodder.—The manner in which Summer grass will grow on soils of poor quality is somewhat surprising. An experiment has been carried out under the supervision of Mr. Richards, a surveyor, in which Summer grass has been grown in a pot containing pure gypsum (plaster of Paris). In the entire absence of nitrogen, the Summer grass has grown to a full-sized plant, showing a fair amount of flag and stem, and maturing seed.

The manner in which the grass grows on the sandstone soils of the poorest quality in the county of Cumberland is well known. Although it is generally recognised as a good pasture grass, only one experiment is on record to show its value as a silage crop. This was carried out at Hawkesbury Agricultural College (see *Agricultural Gazette* for April, 1912). It is stated that the Summer grass silage is relished by the stock equally with the best silage produced there.

Eradication of Summer grass.—Constant cultivation will keep this grass in check. If occurring abundantly in a paddock, drill-sowing of summer crops is absolutely essential, as it is only by constant inter-row cultivation during the growing season that the Summer grass can be checked. The seed is very fertile, and prevention of seeding is necessary if the weed is not wanted the following year.

SWAMP OR BARNYARD GRASS (*Panicum crusgalli*). (Fig. 2.)

Swamp or Barnyard grass is often a weed, but always a good fodder plant. Probably no other grass is forwarded so frequently for identification as this one, and the localities from which it is sent, particularly during a wet season, readily illustrates the cosmopolitan character of the grass.

Although Swamp or Barnyard grass is considered native to this State, it is widely distributed throughout the temperate regions of the globe. It has been known from the earliest times, and owing to its vigorous growing habits in the summer and its suitability as a fodder, the best varieties have been chosen for bringing under cultivation. Japan has been foremost in this direction, and as a result has produced the well-known Japanese Millet. This millet is botanically known as *Panicum frumentaceum,* but there is little doubt that it has originated from the common Barnyard grass (*P. crusgalli*). The main distinction between the two lies in the larger growth of the cultivated plant, the more turgid seeds, and in the absence of awns from the seeds. This millet is known in India as Sanwa Millet, and was first introduced into America under the name of Billion-dollar grass, being unjustifiably

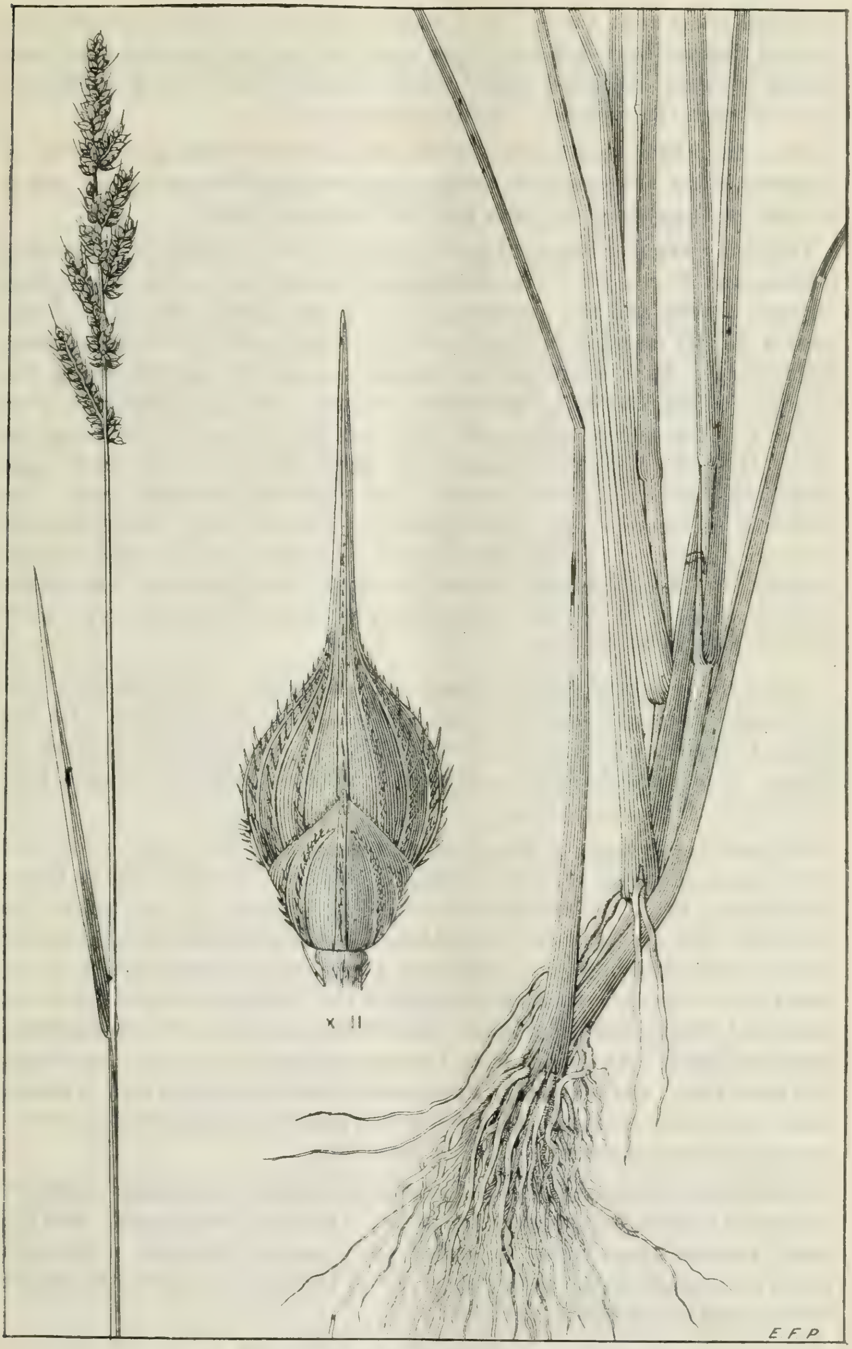


Fig. 2.—Swamp or Barnyard Grass (*Panicum crusgalli*).
Note the fibrous root system, a common characteristic in weedy grasses.

Popular Descriptions of Grasses.

exploited under that name. As a matter of fact the Americans soon discovered that the Barnyard millet they were growing, really a cultivated form of the ordinary Barnyard grass, was in structure and habits practically identical with the so-called "Billion-dollar grass."

From the above remarks it will be seen that the habits and growth of Japanese millet are similar to those of our ordinary Barnyard grass, and a treatise on Barnyard grass holds good for Japanese millet.

The term Swamp or Barnyard grass is applied to two varieties, viz., *Panicum colonum* and *P. crusgalli*. The distinction between the two lies in the more vigorous growth and the presence of awns in the latter. The habit of the grass is slightly creeping, with succulent leaves and stems, and a rather dense inflorescence. It is essentially an annual, coming into growth during the summer months, and dying off in early autumn. Swamp or Barnyard grass is very common on good soils on the coast, tableland slopes, and the irrigation area. It shows a decided tendency for moist situations, and under such conditions proves a constant source of annoyance in cultivated crops. Its growth is so vigorous that it will choke out summer crops unless constant cultivation is given. At Glen Innes Experiment Farm, an area was so badly infested with Barnyard grass that the growing of a summer crop was almost an impossibility. A lucerne and a Bokhara clover crop, however, easily succeeded in smothering it.

Swamp or Barnyard grass is always more abundant in wet summers, and its presence during the last two years has been noticed everywhere. On the Yanco irrigation area it can be found completely occupying the channels in places. It is a prolific seeder, and as it germinates readily, the grass is soon distributed over a large area.

Palatability.—Swamp or Barnyard grass is an excellent fodder plant, but only prior to flowering. An interesting experiment was carried out at Yanco Experiment Farm to determine the feeding qualities of this plant, the cultivated variety, Japanese millet (*Panicum frumentaceum*) being grown to compare with Sudan grass. Stock were grazed on the paddock, and it was found that in the early stages they preferred the Japanese millet to the Sudan grass, but that it would not stand close feeding and died off months before the Sudan grass. The yields from Japanese millet have generally been high at Yanco, Berry, and Glen Innes Experiment Farms, but not as high as Sudan grass. Generally speaking, therefore, Sudan grass is recommended in preference to Japanese millet as a summer catch crop.

Eradication of Barnyard grass.—The annual character of the grass renders it fairly easy to eradicate on cultivated lands. On lands infested badly with the grass, summer crops must be drilled and constant inter-row cultivation given, particularly in the early stages. Once December is passed, the danger from the grass is generally removed.

(*To be continued.*)

List of Fertilisers in New South Wales.

F. B. GUTHRIE, A. A. RAMSAY, AND R. M. PETRIE.

1919 List.

THE accompanying list of manures obtainable in New South Wales, together with their composition, as guaranteed by the vendors, is the result of the revision of the list issued in March, 1918.

The list is published in the interest of the farmers, and it is hoped that it may serve as a guide to those requiring any particular class of manure.

It must be clearly understood that the figures given are not those obtained by analysis of the sample by the Department. They represent the guarantees given by the vendors in accordance with the provisions of the Fertilisers Act.

Where possible, samples have been taken from bulk by one of the officers of the Department, and only those manures are inserted in the list which have been found on analysis to be up to the guarantee.

On account of the war, potash manures are unprocurable, and the market value of other manures may alter. An attempt has, however, been made to assign a "unit value" to the other fertilising ingredients, viz., nitrogen and phosphoric acid, as has been done in pre-war years.

A word is necessary in explanation of the column giving the "manurial value" of the manures. These figures are calculated from the composition of the manures as represented by analysis, a definite unit-value being assigned to each of the fertilising ingredients (except potash). The units on which are computed the values given here are as follows:—

UNIT-VALUES of fertilising ingredients in different manures for 1919.

	Per unit. s.	d.
Nitrogen in ammonium salts	19	11
,, in blood, bones, offal, &c.—fine	22	7
Phosphoric acid in bones, offal, &c.—fine	4	7
Phosphoric acid (water soluble) in superphosphates	6	0

PRICE per lb. of fertilising ingredients in different manures for 1919.

	Pence per lb.
Nitrogen in ammonium salts	10·7
,, in blood, bones, offal, &c.—fine	12·1
Phosphoric acid in bones, offal, &c.—fine	2·4
Phosphoric acid (water soluble) in superphosphates... ...	3·2

To determine the value of any manure the percentage of each ingredient is multiplied by the unit-value assigned above to that ingredient, the result being the value per ton of that substance in the manure. For example, a bone-dust contains 4 per cent. nitrogen and 20 per cent. phosphoric acid:—

4 × 22s. 7d. = £4 10s. 4d. = value of the nitrogen per ton.
20 × 4s. 7d. = £4 11s. 8d. = ,, phosphoric acid per ton.

£9 2s. 0d. = value of manure per ton.

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is affected by local conditions; neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, &c. It is simply intended as a standard by which different products may be compared. At the same time, it has been attempted to make the standard indicate as nearly as possible the fair retail price of the manure, and the fact that in the majority of cases the price asked and the value assigned are fairly close shows that the valuation is a reasonable one.

These figures have been checked in all cases by analyses made on samples collected by an officer of the Department. It by no means follows, however, that the particular product analysed and here published will be in stock for any length of time.

Some agents guarantee two figures—for instance, "from 16 to 18 per cent. phosphoric acid." In these cases the lower one has been published in the list, as it will certainly be the one the vendors will rely upon in cases of dispute.

Now that the Fertiliser Adulteration Act is in force, the purchaser has only himself to blame if he pays for an inferior article. Every vendor is obliged to furnish a guarantee with every delivery of fertiliser, setting forth its actual composition as determined by analysis.

If the purchaser has any reason to suspect the genuineness of the guarantee, all he has to do is to notify the vendor of his intention to take samples for analysis in sufficient time to enable the vendor or some person appointed by him to be present. The samples must be taken before the consignment is finally in the purchaser's possession; for example, if the fertiliser is sent by rail, the sample should be taken at the railway station or siding. Three samples must be taken, one being given to the vendor or his representative, the second kept by the purchaser and submitted to an analyst, and the third forwarded to the Department of Agriculture for future reference, in case of divergence in the analyses of the other two. All three samples must be sealed up.

In the case of bone-dust, blood and bone manures, &c., the valuation has been made irrespective of the fineness of division, and is based on the amounts of fertilising ingredients only; but it must be borne in mind that finely ground bone-dust acts more rapidly than coarse, and that unground fragments of bone only become available as fertilisers very slowly.

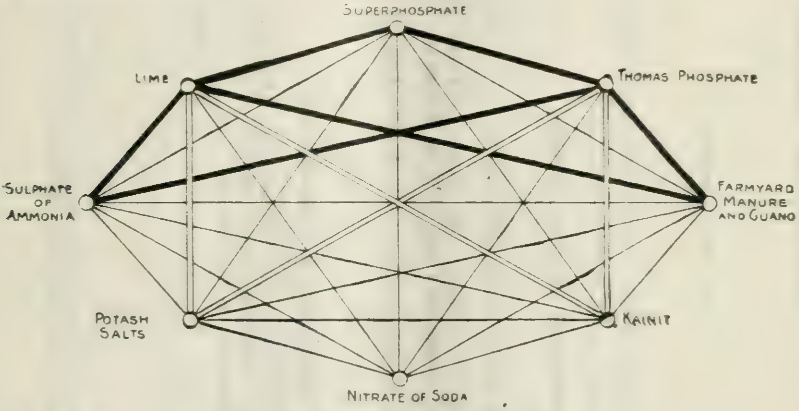
A word may be added in explanation of the term "water-soluble phosphoric acid." When bones or mineral phosphates are acted on by sulphuric acid, a portion of the tricalcic phosphate is converted into another lime compound, known as monocalcic phosphate or superphosphate. This compound is soluble in water, and it is to its presence that the rapid action of the phosphate is due. This is the "water-soluble" acid of the table. In many superphosphates, however, a considerable portion of this compound has undergone change. This change may be due to the salts of iron and alumina present, or to the length of time it has been kept, and it results in the formation of a third lime compound—bicalcic phosphate. This is known as "reverted" or "retrograde" phosphoric acid.

In the fourth table are a number of waste products which may in many cases be economically utilised.

When purchasing a manure, always insist on a guarantee of its composition as determined by the analysis.

Never add lime to a manure containing sulphate of ammonia or blood and bone manures, as in these cases loss of nitrogen results; and when lime has been applied to the land, do not use such manures until about three weeks afterwards.

The accompanying fertiliser diagram, which represents in a graphic manner the points to be taken into consideration in the mixing of different manures, is reproduced in the hope that it will be found useful to farmers who make up their own mixtures.



Substances connected by thick line must not be mixed together.
Substances connected by double line must only be mixed immediately before use.
Substances connected by single thin line may be mixed together at any time.

TABLE I.—SIMPLE FERTILISERS.

Manure.	Where obtainable.	Guaranteed Composition.				Manurial Value.
		Nitrogen.	Lime.	Potash.	Phosphoric Acid.	
		per cent.	per cent.	per cent.	per cent.	£ s. d.
Sulphate of ammonia ..	Geo. Shirley, Ltd., Terry-st., Rozelle ..	20·42	....	..	..	20 6 8
,, ,, ..	Australian Gaslight Co., Kent-st.. ..	20·42	....	..	..	20 6 8
,, ,, ..	Farmers' Fertilisers Corporation, Ltd., 31 Hunter-st.	20·5	....	..	..	20 8 4
Gypsum	,, ,, ,, ..	..	96 Cryst. $CaSO_4$	..	..	....
Sulphate of ammonia ..	Paton, Burns & Co., 75 York-st.	20·42	....		..	20 6 8

II.—BONE AND BLOOD MANURES.

Manure.	Where obtainable.	Guaranteed Composition.		Manurial Value.
		Nitrogen.	Phosphoric Acid.	
		per cent.	per cent.	£ s. d.
Bone-dust	Geo. Shirley, Ltd., Terry-st., Rozelle	3·70	22 00	9 4 5
Bone and blood, 1st quality	,, ,, ...	5·00	17·00	9 10 10
Bone and blood, 2nd ,, ...	,, ,, ...	5·00	13·00	8 12 6
B. and B. manure	Kitchen and Sons, Ltd., 365 Kent-st.	5·00	17·00	9 10 10
Extra B. and B. manure	,, ,, ,, ...	5·00	13·00	8 12 6
Sandown fertiliser	J. Cooke & Co., Propy., Ltd., Sandown Works, Parramatta	6·85	11·40	10 6 11
Bone and Blood manure	Farmers' Fertilisers Corp., Ltd., 31 Hunter-st.	6·04	14·46	10 2 8
Blood	,, ,, ,, ...	12·97	......	14 12 11
No. 1—General Purposes bone-dust ...	Wooster Fertilisers, Ltd., O'Riordan-st., Alexandria ...	3·96	21·68	9 8 10
No. 2—Pure steamed bone-dust	,, ,, ,, ...	3·91	24·50	10 0 7
No. 3—Blood and bone manure	,, ,, ,, ...	4·94	16·48	9 7 1
No. 5—Raw bone-dust	,, ,, ,, ...	4·01	24·41	10 2 5
Pure fertiliser	N.S.W. State Abattoirs, Homebush Bay	6·68	10·87	10 0 8
Blood and bone	R. S. Lamb & Co., 32 Jamieson-st.	4·93	13·73	8 14 3
Bone-dust	M. O'Riordan and Sons, O'Riordan-st., Alexandria	3·70	21·98	9 4 4
Excelsior bone-dust	M. Gearin, Old Botany road, Mascot	3·30	21·98	8 15 3
Bone-dust, B.D. 1	Paton, Burns, & Co., 75 York-st.	3·70	22·12	9 4 11
,, B.D. 2	,, ,, ,, ...	3·70	22·12	9 4 11
,, B.D. 3	,, ,, ,, ...	3·30	20·70	8 9 5
,, B.D. 4	,, ,, ,, ...	3·30	18·40	7 18 10
Bone and blood, B.B. 1	,, ,, ,, ...	6·50	12·00	10 1 10
,, ,, B.B. 2	,, ,, ,, ...	5·50	17·00	10 2 2
Bone phosphate	,, ,, ,, ...	......	29·77	6 16 5
Dried blood	,, ,, ,, ...	13·00	......	14 13 7
Blood	B. Richards and Sons, Ltd., Riverstone	13·70	......	15 9 5
Bone-dust	,, ,, ,, ...	3·17	26·78	9 14 4

III.—SUPERPHOSPHATES, MIXED FERTILISERS, AND IMPORTED FERTILISERS.

Manure.	Where obtainable.	Guaranteed Composition.				Manurial Value.		
		Nitrogen.	Water-soluble Phosphoric Acid.	Total Phosphoric Acid.	Potash.			
		per cent.	per cent.	per cent.	per cent.	£	s.	d.
Superphosphate	Geo. Shirley, Ltd., Terry-st., Rozelle	......	17·00	......	......	5	2	0
Basic superphosphate	,, ,,	......	......	20·00	......	.....		
No. 8 General mixture	,, ,,	4·00	13·00	......	......	7	17	8
No. 10 mixture	,, ,,	2·00	13·00	......	......	5	17	10
Bone and superphosphate	,, ,,	1·85	8·50	20·40	......	7	7	4
Sulphide superphosphate	Gibbs, Bright & Co., Ltd., 37 Pitt-st.	......	17·00	......	......	5	2	0
Nitro superphosphate	,, ,,	1·60	15·00	15·00	......	6	3	6
No. 1 Bone and superphosphate	,, ,,	1·50	8·50	19·00	......	6	13	0
No. 2 ,, ,,	,, ,,	0·80	13·00	19·00	......	6	3	7
No. 1 Superphosphate	Farmers' Fertilisers Corp., Ltd., 31 Hunter-st.	......	17·00	......	......	5	2	0
No. 0 Phosphatic fertiliser	Wooster Fertilisers, Ltd., O'Riordan-street, Alexandria.	3·30	4·20	20·61	......	8	14	11
No. 7 Special fertiliser	,, ,, ,,	5·21	2·20	14·56	......	8	19	10
Superphosphate	Paton, Burns & Co., 75 York-st.	......	17·00	......	......	5	2	0

IV.—WASTE-PRODUCTS, ASHES, &C., NOT ON THE MARKET.

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Insoluble.	Lime.	Phosphoric Acid.	Potash.
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Deposit from wool-scouring tanks 1	Liverpool Wool-scouring Works	....	....	·64	....	....	....	·72
Deposit from wool-scouring tanks 2	,, ,, ,,	....	....	1·02	....	....	·16	·39
Deposit from wool-scouring tanks 3	,, ,, ,,	....	....	1·37	....	....	·14	·2
Deposit from breakers	,, ,, ,,	34·47		1·81	50·68	·85	·88	1·60
Sediment from wool-scouring works	Yass	19·57		·59	8·24	·97	.....	·20
Scutch	Australian Glue-Gelatin Works, Alexandria.	56·98	....	2·95	....	4·56	None.	None
,, from limed pelts	Hugh Wright, Auburn	5·32	72·42	1·80	3·61	9·36	·89	·20
Decomposed hair and lime	Fellmongery	9·70	57·08	6·86	1·22	26·27	....	....
Tan-yard refuse	Tanneries, St. Mary's	6·43	33·83	2·24	21·43	26·96	·67	....
Tan refuse	....	7·10	50·90	2·62	16·03	18·58	·56	·18
Fleshings from tannery	....	·91	75·37	44·43	5·98	....	1·14	·04
Salt (sweepings from tannery)	....	3·04	....	·70	·38	....	....	....
Wool-waste	....	....	....	8·15	....	....	....	....
,,	....	34·33	28·20	1·97	26·03	2·75	·37	·32
Peat	H. Tager, Moss Vale	72·93	16·68	·35	10·39 (ash).	....	....	....
,,	S. Cook, Pyrmont	49·51	34·63	·75	....	....	·06	·01
Burnt peat	....	....	....	....	84·45	....	·25	·33
Filter-press muck	Cane-mills, Broadwater	16·39	26·07	·22	34·86	13·20	5·98	·44
Megass	Clarence River cane	22·86	67·32	·63	8·61	·30	·01	·05
Megass ash	,, ,,	....	....	....	87·69	3·07	·16	·51
,,	Richmond River cane	....	....	....	....	1·11	·21	4·79
Bloodwood ash	....	....	....	....	....	8·47	·27	5·25
Ironbark ash	....	....	....	....	....	....	·82	1·53
Blackbutt ash	....	....	....	....	....	7·27	·04	2·02
Red-gum ash	....	....	....	....	....	....	·38	4·17
Spotted-gum ash	....	....	....	....	....	....	·10	·70
Boxwood ash	....	....	....	....	....	....	·67	1·65
Grass-tree ash	....	·86	1·78	....	33·48	24·94	3·07	5·30
Vine-cuttings ash	....	·49	....	....	60·64	11·34	1·85	3·76
Red-apple ash	....	....	....	....	54·52	13·96	·47	6·00
She-oak ash	....	....	....	....	8·57	42·35	8·85	2·19
Hardwood ash	....	·50	1·35	....	62·38	13·50	1·76	3·09
Ash of wild melon	Stock Branch	....	....	....	....	5·12	4·85	27·08
Wood ashes	....	·30	....	....	21·43	41·37	·35	2·80
,,	Wentworth Irrigation Area	....	....	....	11·12	50·78	·58	3·21
Ash of kerosene shale	Hartley Vale	1·49	27·93	·70	67·59	....	·28	·14
Eucalyptus leaves ash	....	....	....	....	....	....	....	10·54
,, ,,	....	....	....	....	....	....	....	20·50
Camphor laurel ash	....	....	....	....	....	....	....	2·55
Coachwood and sassafras woodash	....	....	....	....	....	16·16	3·60	13·53

IV.—WASTE-PRODUCTS, ASHES, &c., NOT ON THE MARKET—*continued.*

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Insoluble.	Lime.	Phosphoric Acid.	Potash.
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Coals (ash)	....	....	....	....	....	·64	·29	·16
Clinker from locomotive boiler	....	....	....	....	....	....	....	·25
Residue from furnace	R. E. Bragg, Marrickville	1·55	35·63	·54	52·40	·64	·43	·09
Sea-weed ash	....	....	....	....	....	9·27	·49	·59
,,	....	....	....	....	....	6·29	1·27	17·55
,,	....	·43	....	....	56·28	9·39	·47	2·26
,,	Manly	....	....	....	43·06	6·52	·91	13·98
,,	,,	....	....	....	·07	·53	·19	34·30
,,	Mr. Harvey, Department	3·25	19·46	....	61·63	4·22	·33	·22
,,	....	....	....	....	....	4·63	1·00	31·41
Sea-weed, fresh state	....	80·00	....	·16	....	·41	·09	1·18
Sea-weed	....	41·03	42·49	·14	....	....	·21	·60
Sea-weed, dried	....	18·58	65·97	1·64	15·44 (ash).	3·44	·14	·14
Air-slacked lime	....	16·58	....	....	1·88	75·44	....	....
Residue from calcium carbide	....	41·36	....	....	1·08	36·19	....	....
Limestone rock	Queanbeyan	1·10	....	....	4·70	48·20	1·22	....
Agricultural lime	Portland Cement Co.	18·43	....	....	23·80	Hydrate 13·80 Carbonate 43·97	....	....
Gypsum	Marulan	(Crystallised $CaSO_4 = 92·64$)			4·47	....	....	....
Cave deposit, shells, &c.	Cowan, Hawkesbury River	2·11	....	·82	....	35·40	1·59	·88
,, ,,	Macleay River	23·06	16·01	2·43	26·77	13·88	7·40	....
Deposit (coral, shell, &c.)	Pacific Islands	2·13	13·53	·72	....	44·00	3·53	·39
Shells	Pambula River	....	....	....	....	44·59	·10	....
Flue deposit	Maitland	....	....	....	83·75	2·56	·32	·31
,,	Liverpool	....	....	....	91·17	·42	1·29	·17
,, from sanitary furnace	....	....	....	....	63·53	6·64	1·82	1·61
,,	....	6·30	2·45	....	84·89	·32	·35	·38
Night-soil mixed with lime	....	44·33		·74	18·60	7·62	·78	....
Night-soil	Wagga Wagga	6·70		·03	82·19	·44	·28	·69
,,	,,	9·14		·28	78·92	1·18	·18	·54
,,	,,	....		·50	....	....	·64	·62
Night-soil preparation, No. 1	....	8·22		3·73	50·22	13·32	9·65	·91
,, ,, No. 2	....	7·20		1·83	29·02	8·05	4·10	·15
,, ,, No. 3	....	25·95		1·64	60·17	1·39	1·61	·70
,, ,, "Pinhoe" manure	....	·92	9·54	·21	57·58	14·71	1·26	·56
,, ,,	F. Artlett, Parramatta	7·33	30·06	2·10	46·38	2·09	1·92	·61
,, ,,	,, ,,	10·11	42·59	4·97	·94	30·12	·39	....
,, ,,	Mr. Halstead, O'Brien's patent	1·54	12·36	·54	77·95	....	·63	....
,, ,,	....	29·52	56·15	2·55	14·33 (ash).	....	....	....

IV.—WASTE-PRODUCTS, ASHES, &c., NOT ON THE MARKET—*continued.*

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Insoluble.	Lime.	Phosphoric Acid.	Potash.
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Street sweepings	Sydney Municipal Council	61·63	19·57	·35	15·45	....	·42	·28
Farmyard manure	....	67·96	22·09	·40	8·16	·16	·20	·30
Stable manure	Bathurst	39·26	....	·41	....	....	·27	·67
Fowl manure	....	3·95	16·48	1·47	70·16	2·10	1·94	....
,,	....	1·54	15·23	·86	79·96	·64	·59	·33
Sheep manure	Bathurst	7·73	....	1·06	....	....	·69	1·17
,,	Liverpool Wool-scouring Works	9·71	50·91	1·79	32·26	2·30	·91	·92
Sheep dag	....	....	....	3·04	....	....	....	....
Refuse manure	Abattoirs	12·00	74·51	4·14	6·56	....	1·80	....
Flying-fox manure	....	1·09	35·34	3·34	60·29	1·02	·36	1·15
Fish fertiliser	....	14·47	64·36	10·37	4·52	....	....	....
Shark fertiliser	....	9·02	68·04	10·59	3·86	....	7·27	....
Fish manure	....	10·88	59·26	6·10	5·39	9·82	8·28	....
Rabbit hair, long	Anderson, Oxford-street	8·73	88·64	14·03	3·63 (ash).	....	....	....
,, short	,, ,,	9·72	87·76	14·00	2·82 (ash).	....	....	....
Bat guano	....	14·11	17·69	1·55	28·77	13·72	11·42	....
,,	....	10·86	19·65	2·24	51·95	1·75	3·55	·15
,,	....	13·70	34·35	4·76	3·30	22·28	13·04	trace.
Bat deposit	Cave Flat, Cooradigbee	5·43	12·98	·50	57·64	5·60	12·12	....
Guano deposit	Tamworth	8·75	38·40	6·17	12·85	....	9·24	....
,,	,,	8·42	20·97	3·10	31·89	....	7·87	....
,,	,,	14·55	29·91	3·66	15·81	....	12·98	....
,,	,,	9·35	44·32	6·73	7·33	....	13·17	....
Deposit from cave	L. R. Mercy, Ashford	23·75	35·57	3·63	1·65	16·32	11·28	·60
Bone breccia	Queanbeyan	5·71	....	·59	9·48	42·80	3·11	....
Muck from waterworks reservoir	Maitland	4·84	17·55	·74	63·42	4·56	·31	·60
Muck raked from waterhole	....	63·66	29·86	·81	3·80	·96	·10	·06
Sawdust	....	33·52	62·35	·82	....	....	1·70	·05
Decayed wood, bark and leaves, bloodwood	....	57·80		·74	40·68	1·30	....	....
Decayed wood, bark and leaves, pepper-tree	....	79·92		·8	17·77	1·50	....	....
Cocoanut oil cake	....	8·24	....	3·29	....	....	1·20	1·49
Castor cake	....	18·81	74·08	4·30	....	....	1·83	·86
Pea cake	Java	16·02	....	7·24	....	....	1·46	1·17
Bean cake	North China	14·52	80·32	6·77	....	....	1·33	1·99
Rice husks	....	42·74	42·15	1·07	13·77	·02	·03	·04
Field pea, whole plant	....	88·58	9·97	·55	....	·15	·12	·49
Tares, whole plant	....	83·97	14·96	·73	....	....	·11	·21
Marsh mallow, whole plant	....	79·00	17·86	·85	....	....	·14	·69
Horse bean, leaves and stalks	....	82·87	15·90	·90	....	·05	·11	·54

WESTERNWOLTH'S RYE GRASS AT YANCO.

A COMPARATIVE trial has been conducted at Yanco Experiment Farm to ascertain the relative merits (for green feed production) of Westernwolth's Rye grass and of the more widely-known Italian Rye grass. Trials on other Experiment Farms have in many instances shown that the former grass is much superior in actual weight of green feed produced, besides being slightly earlier in maturity. In other cases Italian Rye grass has given excellent yields, exceeding those of Westernwolth's. The latter has been the experience at Yanco, though the margin of difference is very small.

The following are the weights of green feed per acre:—Westernwolth's Rye grass, 8 tons 1 qr. 4 lb.; Italian Rye grass, 8 tons 5 cwt. 1 qr. 20 lb. The size of each plot was $\frac{1}{16}$ acre.

During the earlier stages of growth the increased height of Westernwolth's led one to expect a much greater yield than the other variety. The unexpected result can be attributed to the fine straw and the slightly denser growth of the Italian.

Apart from the botanical differences, it was difficult to distinguish between the varieties, both having the characteristic shiny leaf of a dark green colour.

Dried hay yields were also obtained, and are as follows:—

Variety.	Greenstuff, $\frac{1}{16}$ acre.	Dried Hay, $\frac{1}{16}$ acre.	Percentage of moisture lost.	Dried Hay per acre.			
	lb.	lb.		t.	c.	q.	lb.
Westernwolth's ...	1,122	362	67·73	2	11	2	24
Italian	1,158	438	64·28	3	2	2	8

From these results it will be seen that the Westernwolth lost more moisture while curing than the Italian.

A certain amount of dried hay was fed to a few milch cows, who ate it with greedy relish, pointing to the sweetness and palatability of the hay.

Cultivation.—The land used for the trial had been under fallow the previous summer and was ploughed early in the autumn, and later worked down with the two-way disc cultivator. Grading, building of check banks, and a watering to assist germination, were done immediately before sowing.

Both varieties of rye grass were sown on 6th June, 1918, 25 lb. of seed per acre being broadcasted by hand and harrowed in, while 60 lb. superphosphate per acre had previously been sown with the wheat drill.

Germination was splendid, and assisted by occasional helpful showers of rain, a very even and dense growth resulted, reaching 2 feet in height. The rainfall to harvesting was 588 points. An application of water was necessary just as the heads were forming to carry the grass on to maturity.

Conclusion.—While the first comparative trial has shown that Westernwolth's Rye grass is slightly earlier in maturity than Italian Rye grass, further trials are necessary to determine conclusively the superiority of either in the production of green feed.—E. FURBY, Experimentalist.

The Insect Pests of Maize.

[Continued from Vol. XXIX, page 650.]

W. B. GURNEY, F.E.S., Assistant Entomologist.

"Cutworms."

On page 111 of the last issue, the writer dealt with tests of several bran and Paris green, and bran and arsenic mashes, as baits for the control of "cutworms." Good results were obtained by using baits made to the formulæ below, and spread along the rows of seedling maize in handfuls as a damp crumbly mash, over 75 per cent. of the cutworms being killed in one night.

Paris green, 1 lb.
Bran, 24 lb.
Water, 3 quarts, with 3 oz. salt dissolved in it.

or

Paris green, 1 lb.
Bran, 24 lb.
Water, 3 quarts, with 6 oz. treacle dissolved in it.

It has been found in these experiments that white arsenic when used at the same strength as Paris green was much less attractive and effective; this may have been due to the fact that the arsenic contains nearly twice as much arsenious acid as the other. In view of the shortage and increased cost of Paris green, it is thought that 9 oz. of white arsenic might be substituted for the 1 lb. Paris green referred to in the two formulæ.

It may be mentioned that it has been found elsewhere that six lemons or oranges, finely chopped up and added to the water when mixing the mash, render the above baits more attractive to the cutworms.

Success has been attained in South Africa and elsewhere by using foliage such as maize tops, potato haulms, turnip tops, &c., chopped up and stirred for about five minutes in Paris green water (1 lb. to 10 gallons). The green bait is thus poisoned, and is then scattered as in the case of bran baits.

The species of "cutworm" so destructive at Wollongbar Experiment Farm last December, and referred in the last issue, was *Agrotis radians*, while a few of another species, *Prodenia litura*, were also present. At the Grafton Experiment Farm six weeks later, the writer found that the *Prodenia* were more prevalent than the *Agrotis*. Both these species were also found attacking the lucerne. It is well to point out that "cutworms" are the caterpillars of a family of many species of small moths, viz., the Noctuidæ, which usually feed at night, hiding by day in the soil. Characteristically the grubs curl up when touched or disturbed.

Naturally, when attacking young seedlings the caterpillars readily eat through the stems, thus cutting off the tops, hence the name "cutworms." Later, when the plants are older, thicker-stemmed and tougher, the caterpillars may succeed in only gnawing the stems and destroying leaves, and thus stunting growth without cutting the plants right down. But when plentiful, the swarms of cutworms are capable of stripping well-grown crops bare of foliage, and even eating down the stalks. In most cases the use of poisoned baits mentioned above is invaluable in controlling these pests. Spraying a narrow strip of the crop with Paris green or arsenate of lead in front of advancing swarms of cutworms is a method sometimes effective in checking the pest, especially Army worms, the sprayed strip being afterwards cut and burned. Trenching a deep furrow in front of their advance and spraying or crushing the caterpillars which accumulate in thousands in the steep-sided furrow, is also a useful method.

ADDITIONAL SPECIES NOW RECORDED AS MAIZE PESTS IN NEW SOUTH WALES.

To be added to the list already published.

"Cutworm" *Agrotis radians* Guen. (syn. *Agrotis munda*).
- Damage.—Maize, lucerne, and vegetable and other crops.
- Adult.—Brown forewings, hind-wings smoky white. Harmless stage.
- Caterpillar or "cutworm" (see Fig. *a*).—Brown to smoky black colour; scattered hairs, slightly flattened dorso-ventrally. Coils up when disturbed or picked up.
- Pupa (see Fig. *b*).—Brown, with two posterior spines. In soil.

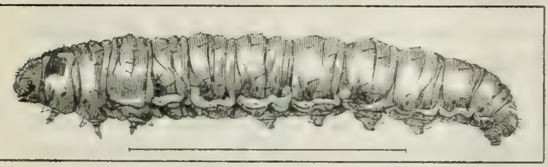


Fig. *a*.—A "Cutworm" of Seedling Maize (*Agrotis radians*).

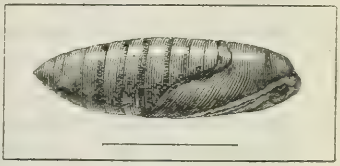


Fig. *b*.—Pupa of "Cutworm" (*Agrotis radians*).
Taken from the soil against seedling maize.

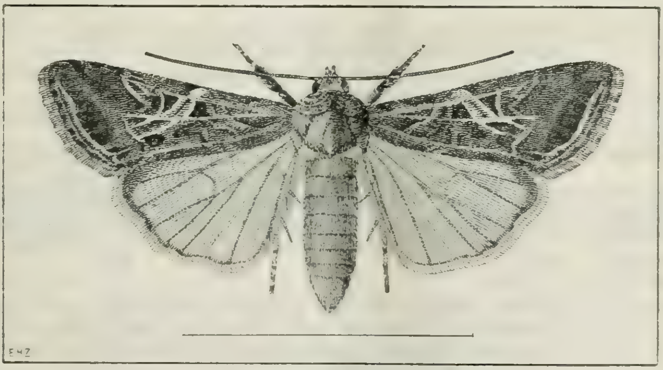


Fig. *c*.—A "Cutworm" Moth (*Prodenia litura*).
The adult stage of a Cutworm.

"Cutworm" *Prodenia litura* Fab. (syn. *Hadena littoralis*). (See Fig. *c*.)
- Damage.—Will attack maize, lucerne and other crops, also various weeds and lantana.
- Adult.—Forewings brown with white distinct blotches; hind wings white with smoky brown tip and thin brown streak parallel with most of the outer margin.
- Caterpillar.—Dark brown, with series of yellow and black spots along each side of body.

Beetle.—*Aulacophora olivieri* ("The Pumpkin Beetle"), omitted from former list. This common pest of pumpkins and vegetable and garden plants also attacks the leaves and silks of the maize. In this case the adult beetle does the damage, not the grub.

Among the most serious pests of the Northern Rivers districts, in the opinion of Mr. Marks, Manager of the Grafton Experiment Farm, is the little yellow Monolepta beetle, and it certainly has a good claim to this reputation.

The Yellow Monolepta Beetle (*Monolepta rosæ* Blackb.).

(See Coloured Plate. Fig. 9.)

This is not an introduced pest but a native of our North Coast river districts, which has not so far been recorded from other parts of New South Wales. The little beetle is about ¼ inch only in length, with yellow body and legs, above and below, and with a bright cerise red patch on each shoulder, as well as a single cerise spot near the middle of each elytron.

Damage.—Attacks the silk of the maize cob. It is also a serious pest of the orchard, attacking blossoms and foliage of citrus, stone, and pip fruits indiscriminately, the huge swarms which settle on the trees being able to denude the trees of most of the bloom and young foliage in a few days. The beetles also swarm on the wattle blossoms, *Acacia podalyriæfolia* and *A. baileyana* being two species we have recorded them on, and they will remain infesting these wattle trees through the whole of winter, as I have recorded during the past year. Mr. Marks informs me that this is their usual behaviour at the Grafton Experiment Farm, and from thence they pass to the orchard trees. The pepper tree (introduced) is also a favourite food both in the winter and again in midsummer (January).

DATES OF APPEARANCES OF THE MONOLEPTA BEETLE, AND LIST OF PLANTS ON WHICH IT FEEDS, DURING YEAR FROM MARCH, 1918, TO FEBRUARY, 1919.

1918.	
March ...	Present in maize crops. Had recently left orchards.
April ...	In maize. Disappearing by end of month.
May ...	Attacking wattle trees (*A. podalyriæfolia*) by 22nd of the month.
June ...	More numerous on wattles.
July ...	On *Acacia baileyana* and pepper trees which bloomed this month.
August ...	Still on wattles and pepper trees.
September ..	On the 2nd found to be leaving the wattles and swarming on to the blossoms and leaves of orange and other fruit trees.
October ...	By about the 15th the Monolepta had disappeared from the orchard.
November...	Monolepta absent from orchard trees, wattles, and pepper trees, probably the beetles at this time were in the larval stage.
December ...	Ditto ditto ditto
1919.	
January ...	On 9th January Mr. Marks reported Monolepta to be appearing on wattles. From the 18th to end of month they appeared on wattles and also pepper trees, on which they fed on the green berries and the foliage.
February ...	Expected to leave the pepper trees for the fresh shoots of orchard trees should rain occur before this goes to press. In previous years in February, orchard trees have been attacked.

The interesting features of this record is the lengthy adult life and the survival of the beetles in activity through the cold winter months, while the absence for three months from early October to early January would indicate that they are then hidden in the larval stage, probably feeding in the scrub. Search has so far failed to reveal their natural food.

With the above record it becomes apparent that the readiest method of controlling the pest in maize crops may be by attacking the beetles when on fruit trees or on the wattles, which latter, together with the pepper trees, may yet prove useful trap trees, and permit of the beetles being destroyed before they reach the orchard or the maize. But the beetles, as experiments have proved, are not readily killed by contact sprays nor yet by hydrocyanic gas fumigation, owing both to their hardiness and to their extreme activity on the wing. When disturbed by spraying or jarring they are able to rise in clouds from the trees with almost the speed of flies, and the necessity for strong pressure sprays from all sides of the tree to bring down the bulk of them has been found in practice both by Mr. Duffy (Orchardist at Grafton Farm) and myself when experimenting. However, a long series of sprays were tested by the writer, and these are described below, together with notes on those which proved most effective and those which might be used with safety on the blossoms as well as on the foliage of fruit trees. The large size and unknown numbers of wattles and pepper trees will militate against these trees being sprayed in winter as a check against the Monolepta, except where isolated trees are found to be obviously the source of infestation of an orchard.

Fumigation—

Hydrocyanic acid gas. Used full strength as for scale insects for twenty-three minutes, *i.e.*, half the usual time of exposure, in hope of not affecting blossoms. However, though many beetles dropped to the ground a few only had been affected by the gas and a very small percentage killed. Similarly, the gas used full strength and full time Mr. Duffy found did not kill many beetles. Again, both Mr. Duffy and I found it impossible to get the tent over medium and large trees without driving vast numbers of the beetles up on the wing.

Contact sprays—

Kerosene and soap emulsion—1 part kerosene to 11 parts water; killed about 40 per cent.

Benzole and soap emulsion—1 part in 80 parts water, killed about 18 per cent.; 1 part in 40 parts water, killed about 25 per cent.

Benzole was found not to damage blossoms seriously, but as at the present time this substance seems scarce and almost unobtainable on the market, the value of benzine was tested.

Benzine and soap emulsion—1 part in 80 parts water, killed about 15 per cent.; 1 part in 40 parts water, killed about 22 per cent.

Blackleaf 40 (nicotine sulphate)—1 part in 500 parts water without soap ineffective. Even specimens dipped into spray were not killed. Then soft soap was added and still it was ineffective, a few odd ones only being killed, perhaps 1 or 2 per cent.

Formalin and soft soap—1 part formalin to 50 parts water, about 8 to 10 per cent. killed. Used without soap this mixture was very mildly effective.

Soft soap and water—1 lb. to 8 gallons water, killed only 1 or 2 per cent.

Carbon bisulphide—¾ per cent., in water, with soft soap added, killed scarcely any.

Potassium cyanide solution—1 lb. in 16 gallons water (no soap); killed scarcely any.

Red oil emulsion—1 part in 40 parts water, with soft soap; killed 20 to 25 per cent.

Fish oil—1 part in 40 parts water, with soap; killed 25 to 35 per cent.

Starch—1 lb. to 6 gallons water (starch mixed in boiling water first and then diluted); not effective.

Resin and soda—1 lb. resin, ½ lb. washing soda, to 8 gallons water; killed 30 to 35 per cent.

Poison Bait—

Arsenate of lead 2½ oz., molasses 2 lb., fruit juice from 2 lb. oranges boiled in water. Total water 2 gallons. Sprayed on to leaves and twigs of pepper tree where beetles were swarming. Thought to kill between 10 and 20 per cent. Further tests necessary, as it seemed likely to be useful.

Smudging—Smoke fires, the writer found, readily drove the beetles out of the trees.

From the tests so far made it would seem that the results were good with about half a dozen contact sprays, for it must be remembered that these tests were made with a sudden spraying, directed for a few moments against clusters of beetles on the foliage, principally on pepper trees, and that the beetles rise on the wing almost instantly; the percentages were estimated as those which fell and died. Now it is found that by using more spray on those on the ground, after they have fallen, more by far can be killed, so that if this had been done the percentages killed would have been much higher. The endeavour was to find incidentally what sprays brought the beetle down quickly or immediately. So far the benzole, or its substitute as a light oil, the benzine, would be safest to use on blossoms infested with the beetles. For the beetles attacking only the leaves of fruit trees, several sprays would be very useful, and are to be tested comparatively on a larger scale when the fruit trees are infested. Thus, resin and washing soda spray, or the red oil, fish oil, or kerosene and soap emulsions, are all likely to kill a large percentage, especially if used at night or in the early morning. The results of further tests will be published later.

It may be mentioned that the writer tried smudging, that is, using smoke fires placed to the windward of fruit trees infested, and the beetles rose in clouds at the first whiff of smoke, and a few persistent fires would probably readily drive the beetles from the trees and the orchard. Though this might only be of temporary value, as the beetles would return possibly, or be driven on to other infested trees, yet it may give at a critical time sufficient respite from the beetles to allow the fruit blossoms to set. As mentioned before, further experiments are in hand, as it is thought that in handling this pest in the orchard or elsewhere we are at the same time likely to save the maize crops from severe infestation.

The Yellow Maize or Peach Moth (*Conogethes punctiferalis* Gn.).

The body and wings of this moth are bright yellow in colour, dotted with brown, giving a definite speckled appearance to the insect. It has been recorded previously in this *Gazette* by Mr. Froggatt as a pest of peaches, the grub attacking these fruit when green and tunnelling within, much as the codlin moth grub does in apples. The grubs will also attack sorghum heads.

In maize the grubs are found infesting the cobs mainly, but will also bore in the stems. When infesting cobs they usually line the bore with silk, and

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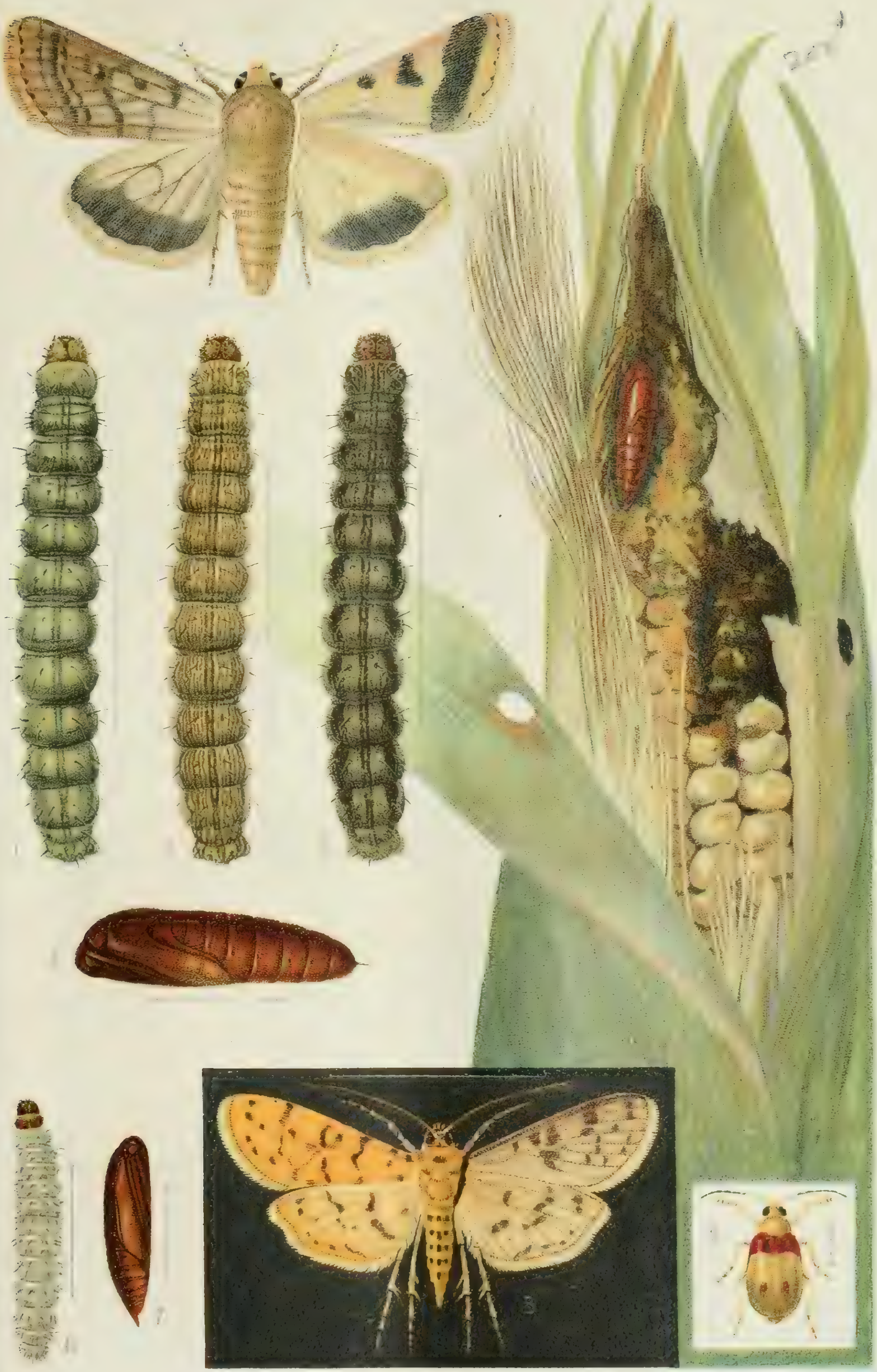
Some Insect Pests of Maize.

(See Coloured Plate.)

1. Larva of Corn Ear-worm (*Chloridea obsoleta*).
2 and 3. Larvæ of Corn Ear-worm showing wide variation in colouring.
4. Pupa of Corn Ear-worm.
5. Adult stage of Corn Ear-worm.
The cob shows damage by Corn Ear-worm pupa *in situ*. (This occurs occasionally—the larva usually pupates in the soil).
6. Larva of Yellow Maize Moth (*Conogethes punctiferalis*).
7. Pupa of Yellow Maize Moth.
8. Adult stage of Yellow Maize Moth.
9. Yellow Monolepta Beetle (*Monolepta rosæ*).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this silken tube may extend as a pipe up through the silk and tip of the sheath to open externally. The core, the grains themselves, and the sheath and silk are eaten and damaged by this pest, which however is not as prevalent nor as serious a pest as the Corn Ear-worm.

The *larva* (Fig. 6 on coloured plate) is narrower than that of cutworms, and in colour is palest buff or slaty white, with pale brown spots marking the position of scattered fine indistinct hairs. Sometimes the body is suffused with a faint pink or greenish tint. The head and dorsal surface of segment behind head is brown in colour. The full-grown larva is just under an inch in length.

The *pupa or chrysalis* (Fig. 7 on coloured plate) is relatively long and narrow and of dark chocolate brown colour, and not so shiny as the ear-moth or cutworm pupæ are. Also, the pupæ are found in the cob or stem where the grub has been boring, which is unusual with the other cob grub (viz., the Ear-worm), which usually pupates in the soil though it will occasionally pupate in the damaged tip of a cob on the stalk as is figured in the plate.

The adult moth (Fig. 8) is a little over 1¼ inch in wing expanse; whole body and wings are a bright yellow with brown spots.

This maize moth is, like the little Monolepta beetle, a native species, and though not confined to our North Coast districts, is most prevalent there; on occasion it is destructive to peaches from Sydney north to Newcastle, and southward in the Illawarra district.

This species was found commonly in the grub stage in the maize during March and April, 1918.

The Maize or Corn Ear-worm

(*Chloridea obsoleta* Fab., syn. *Heliothis armigera*).

(See Coloured Plate.)

This common moth is a pest of maize almost the world over, and perhaps is equally well known as the Tomato worm, while in parts of United States it is known as the Cotton Boll-worm.

Food plants of caterpillar.—Maize, tomato, peas, beans, tobacco and some weeds; also in New Zealand and South Africa has been reported attacking fruit.

Food of the moth.—Nectar of flowers.

This species is common and widespread throughout this State, and while more common along the coastal districts is found inland, and even in the New England and the Tumut districts. Both the moth and the caterpillars vary very much in colouring. The caterpillars vary so much that it is difficult to realise that they develop into the same species of moth. Some are pale green to dark green in general ground colour with little or much black marking dorsally; others are pale yellow with brownish markings; others are buff coloured with broad brown striping dorsally and laterally. This brown type was found commonly at Grafton. Other caterpillars are of the palest yellow or fawn with faint pink spotting; others again are grey in general colour, varying to being heavily marked with black. The figures of the coloured plate indicate green and yellowish types and one green form marked with black. The young caterpillars also vary amongst themselves and from the older ones. The adults or moths vary also in colour from palest buff to yellowish and ruddy fawn. The plate figures a dark moth, and shows both upper and under surfaces of wings.

The caterpillars of the Ear-worm moth, as the name infers, most frequently attack the cobs and the ear. Characteristic damage is a round hole marking the entrance or exit through the green sheath, inside the top and sides of the ear eaten, numerous grains eaten or damaged, and the ear rendered liable to entrance of moisture, the growth of mould on the ear, and also to the entrance of various other maize pests, including the "Weevil" and the "Angoumois moth." However, sometimes the Ear-worm also freely attacks the silks and tassels.

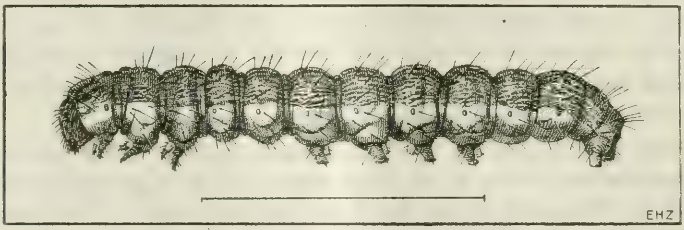


Fig. *d.*—**Maize or Corn Earworm** (*Chloridea obsoleta*) **(side view).**
Showing legs, dorsal markings, and the arrangement of hairs on the segments.

The tassels in January this year at Grafton were very heavily infested, 94 per cent. of the plants had been damaged and 86 per cent. had the tassels actually infested with Ear-worms, numbering from one to eight on each tassel, with an average of three or four.

The cobs have shown infestations of from 20 to 50 per cent. on different occasions, and odd Ear-worms may be found as late as the end of May and in June.

The eggs are frequently to be noted as minute round whitish bodies less than the size of a pin-head, attached to the silks. From two or three up to a dozen or more may be seen on different silks. These eggs hatch in a few days, and the young caterpillars or ear-worms feed on the silks, and as they grow older burrow down through the silks to the ear, or eat out a circular opening through the cob husk direct to the ear. After some fourteen days or more the grubs crawl out of the cob and bury themselves in the soil, where they change to the brown quiescent pupal stage. About fourteen days later the adult moth emerges, pushes its way to the surface and flies off, later to lay eggs on the maize, tomatoes, &c. It seems probable that at least three or four broods occur, but they overlap; the pest in all stages of growth of the caterpillar and also as adults may be found on the same day. Further data is being gathered with a view to ascertaining what time of planting is most likely to avoid damage or what methods may give some control of this pest.

The Seedling-gum Moth

(*Nola metallopa* Walker).

EXTENSIVE DAMAGE TO RED GUM FORESTS.

W. W. FROGGATT, F.L.S., Government Entomologist.

IN 1899, when visiting a plant nursery at Botany in the early part of the year, the foliage of a number of the seedlings of the West Australian Crimson-flower Gum (*Eucalyptus ficifolia*) were found by the writer to be badly infested with small hairy caterpillars.

The man in charge of the seed-beds said they were a very serious pest, spoiling large numbers of the young trees by stripping off all their foliage. In writing up the life history of this curious little caterpillar, figured and described in this Gazette (vol. xi, p. 647, 1900), the writer stated that it was a comparatively rare moth in collections, though described many years ago from Australia. The genus *Nola* contains a number of different species of small moths confined to forest lands. Three species are common in Great Britain, four are found in Ceylon ; Hampson described twelve species from India, and others attacking the oak, willow, and witch-hazel are peculiar to North America.

Since the date of the previous publication (1900) only odd specimens have been sent in on two or three occasions, and reported to be damaging young gum trees. Through the observations of the Forestry Commission we now have a record of the moth caterpillar doing very extensive damage to the red gum (*Eucalyptus rostrata*) in the Deniliquin district.

Forest Office,
Barham, 20th November, 1918.

Subject :—Part of Koondrook State Forest, Parishes Danberry and Cangan, affected by insect pest or disease.

I HAVE the honor to report that I was on part of Koondrook State Forest No. 625, Parish of Tittil and Danberry, County Wakool, yesterday, and noted that a large area of *Eucalyptus rostrata* is affected, apparently with insects or disease. Scarcely any of the trees have any green leaves left on them, and the small branches and twigs are sapless and mostly dead. Some of the leaves are partly eaten away, in some instances leaving little more than the mid-ribs, and in others the outline of the leaf is complete, but the fleshy green part is eaten and the network of veins is left. On many of the trees large reddish-brown irregular patches appear, caused by the outer thin layer of green bark being eaten off. The bark is quite tight on the trees and there appears to be a shortage of sap.

There is a small, cream-coloured hairy caterpillar very numerous on the trees this season. I have never noticed this caterpillar before, and I am quite certain that these have something to do with the damage of the trees, but whether they are the sole cause, or whether there is some other insect or disease assisting I am unable to say.

The area affected extends from the northern boundary near Portion 27, parish Danberry, southward to the Crooked Creek and nearly to the Barham Station telephone line in "The Reeds." I am not able to say how far it extends towards The Mylock ; it extends at least a mile east to the north to south break which Overseer Walker cleared last year, but I know that from 6,000 to 7,000 acres are affected. I was unable to get eastward towards The Mylock as there was too much water and the swamps boggy, but I will know its eastward limits in a day or two.

Odd trees are not affected and others only slightly, but these do not represent more than 5 per cent. of the forest, and trees of all sizes are attacked, both in the swamps and on the higher ground.

It is too early to estimate what percentage, if any, will die, but it seems to me that some will certainly die. Much depends on whether it is the caterpillars that are solely responsible for destroying the leaves, and if so, whether the trunks and larger branches will retain sufficient vitality to make a fresh growth, or whether they are only a secondary consideration and that it is some disease like the Lerp, which is attacking the ironbark in the coastal districts.

P. J. McCORMICK,
Forest Guard.

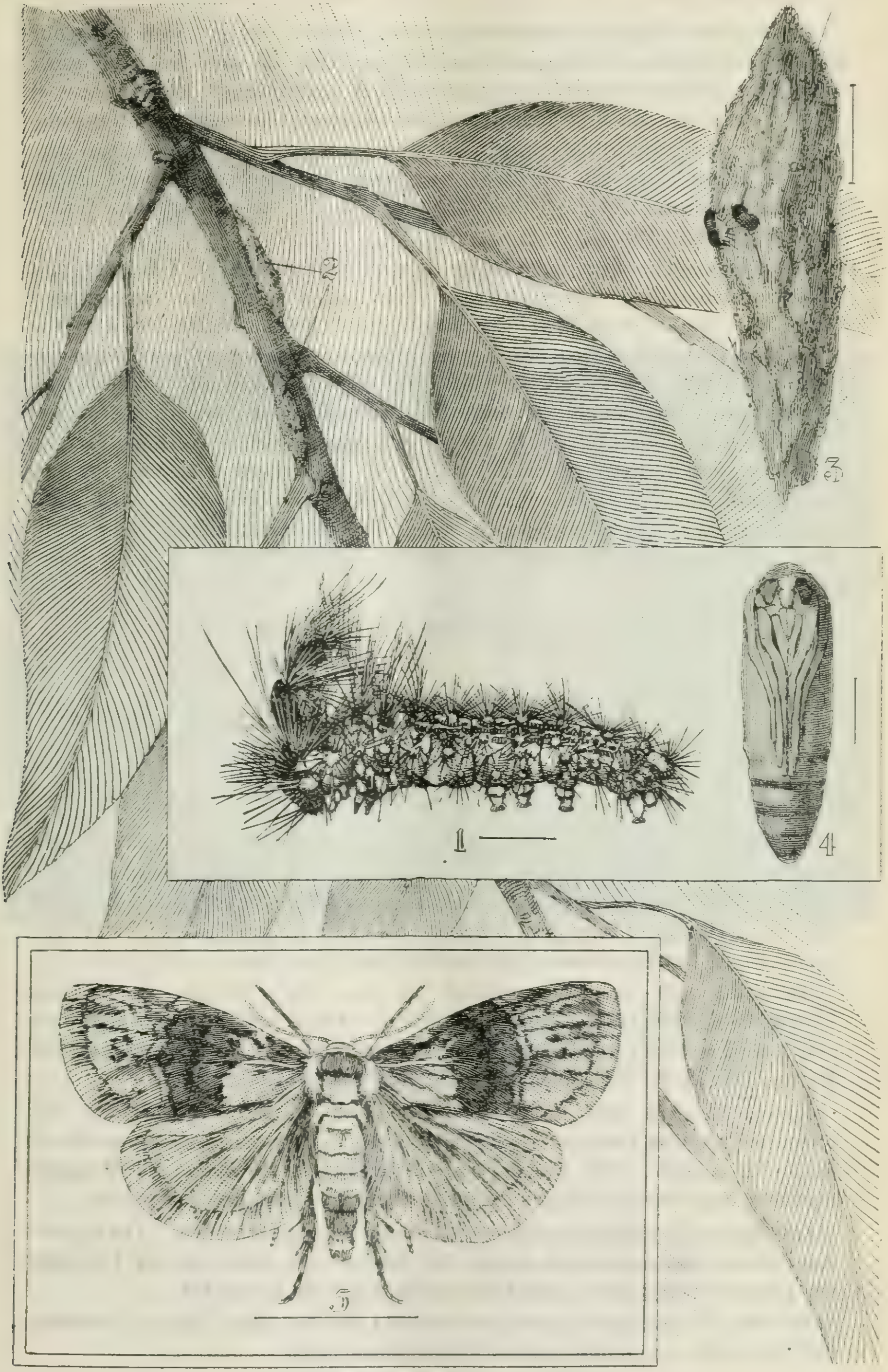
The Inspector and District Forester,
Deniliquin.

The District Forester, Mr. J. S. Parry, in forwarding Mr. McCormick's report, says that "100,000 acres, and probably much more, look as if a bush fire had swept through the red gum forest, and in places there is little or no shade or cover; I do not know if this insect by an occasional visit would do much damage, but if they are going to be an annual pest they must seriously affect the growth of the red gum." With the experience of what leaf-eating moth caterpillars can do in this and other countries when unchecked, all such forest insects should be kept under close observation. It is, however, probable that this pest, being a native insect, will be soon overtaken by its natural enemies, or run itself out in a year or two.

General Description.

The Caterpillar is about half an inch in length, the colours in the immature specimens varying from almond white to pale yellow, but in the full-grown larvæ much darker. The general form is slender, the sides and ventral surface pale yellow, with lines of alternate black and grey running from behind the head to the anal tip of the former portion, the dorsal surface grey. The head is rounded, with the eyes black and surrounded with pale yellow, out of which spring a number of black hairs; on the summit of the head rises a regular pyramid, apparently formed of the successive moulted skins of the head, which, becoming attached to the hairs upon either side, are not cast off with the rest of the skin, but remain one above the other like an ornamental head-dress. The sides of each segment bear two rounded tubercles, clothed with long grey hairs forming a regular rosette; the dorsal surface of each segment with a light creamy grey tubercle on either side of the dorsal stripe, surmounted with similar grey hairs, which are shorter than those on the sides; the apical segments of the abdomen narrower; the anal one rather truncated, bearing seven small rounded tubercles.

The Pupa.—When the larva is full-grown it crawls on to the stem of the tree, and attaching itself to the bark makes a tent-like cocoon of silken sheet attached to the bark all round the edges, of an elongate oval form, covered with bits of bark, and so exactly of the same colour as the bark to which it is attached, and sloping down so naturally at the extremities, that it requires a very careful examination to detect them if there are several on the same stem, as they appear at first sight to be simply swellings of the bark.



The Seedling-gum Moth (*Nola metallopa*).

1. Caterpillar, showing cast skins of previous moults attached to the hairs on the head.
2. Cocoon of pupa on branchlet. 3. Cocoon (enlarged). 4. Pupa. 5. Moth.

The enclosed chrysalid measures about 4½ lines in length. General colour pale reddish-brown, slender and cylindrical in form. Viewed from the upper surface it is rounded at the apex of the head, contracted behind where it joins the thorax, the first four abdominal segments enclosed with the wing-cases are small, the others larger, and the one rounded to a conical tip. Viewed from below the eyes are very large, wing-covers long and ample, reaching to the apex of the fifth abdominal segment, legs and antennæ folded straight down in front.

The Moth.—The first moth came out in the middle of February and several came out during the week. The length across the outstretched wings was just under an inch; the length from the front of the head to the tip of the body, 3½ lines. The general colour of the upper surface of the wings is silvery grey, with the four wings transversely banded with a small barb of metallic coppery brown near the shoulder, and a much larger one of the same colour near the centre of the wing, tapering to its hind margin, with the outer edges also slightly mottled. The head is small, with long palpi, small eyes, and long antennæ. The thorax is ornamented, with a fine grey band across the apex, below a broad band of copper-tinted scales. The hind wings are of a uniform greyish-brown colour.

A Record Milk Yield.

L. T. MacINNES, Dairy Expert.

In December the Milking Shorthorn cow, Lovely II of Glenthorne, the property of Mr. W. H. Dudgeon, of Glenthorne, Bangalow, completed her official test for 365 days under the United Pure-bred Dairy Cattle Breeders' Scheme. Her yield for the period was 18,418 lb. milk, 767·43 lb. butter-fat, or 901·67 lb. butter as computed on the O'Callaghan chart.

The milk yield establishes a record for New South Wales, the previous highest being Brighton Vanilla II with 18,197 lb. Other cows which have given milk records comparable with these are the two Milking Shorthorns, Melba VII, 17,364 lb., and Empress of Burradale, 15,073 lb.

Lovely II gave birth to a bull calf on 5th December, 1917, and was tested for the first time on 8th January, 1918. Her last test was carried out on 3rd December, 1918, 363 days after calving, or six days (excluding the first four days after calving) anterior to the close of the 365-day period.

On the last day's test she gave 43 lb. milk, 1·7 lb. butter-fat. The highest yield during any one month was on the second test, when on 5th February she gave in twenty-four hours 66 lb. milk, 2·238 lb. butter-fat.

For the 273-day period her yield was 14,283 lb. milk, 592 lb. butter-fat (693 lb. butter computed on the O'Callaghan chart).

Lovely II is a light roan of good constitution, showing the characteristics of a good dairy cow, and was bred by Mr. H. Dudgeon, of Jamberoo. She was born in 1909, and was thus in her ninth year when she made the above record.

During the testing period she received in addition to paspalum pasture a little bran and sweet potatoes while being milked. In September the ration was 3 lb. bran, 5 lb. oaten chaff ; October, 4 lb. bran, 8 lb. oaten chaff, and a small quantity of chopped-up sweet potatoes ; in November and December, 5 lb. bran, 8 lb. oaten chaff, and in December a little green maize in addition.

Milking Shorthorn cow Lovely II of Glenthorne (No. 3898, Vol. IV, M.S.H.B.).
Yielded 18,418 lb. milk, 767·43 lb. butter-fat (901·67 lb. commercial butter), in 365 days.

The butter-fat yields for each month were :—January, 73·85 lb. ; February, 87·51 lb. ; March, 71·89 lb. ; April, 60·96 lb. ; May, 59·76 lb. ; June, 57·12 lb. ; July, 58·47 lb. ; August, 58·5 lb. ; September, 64·54 lb. ; October, 69·03 lb. ; November, 54·85 lb. ; December, 50·95 lb.

On no occasion did more than thirty-five days, or less than twenty-six days, elapse between each visit of the tester.

Her pedigree is as follows :—

Lovely II of Glenthorne (No. 3898, Vol. IV, M.S.H.B.). Sire, Gentle Prince (roan), bred by W. H. Dudgeon, Bangalow ; sire of sire, Red Prince (red), bred by H. Dudgeon, Jamberoo ; dam of sire, Gentle (dark roan). Dam, Fanny II, bred by H. Dudgeon, Jamberoo ; g dam Fanny I ; g g d Magnet ; g g g d Mary.

BEES AND FRUIT.

COMPLAINTS have been common this season that bees have attacked the ripening fruits, especially those with comparatively thin skins, such as plums, grapes, &c. In this connection it should be distinctly understood that the bee is not the original transgressor, and has no organ which will enable it to perforate the skin of a fruit. Some people find this difficult to grasp, especially when they recall the power of the bee to insert its sting with considerable force into the human skin. The analogy is incorrect, as the bee only uses the sting when acting under provocation, fancied or real, and its use of this "offensive-defensive" weapon often, though by no means invariably, results in its death.

The skin of the fruit which is attacked by the bees as a source of food must have previously been punctured in some way, and the primary agencies are among the following:—

1. Birds, especially sparrows and silver-eyes, which have been very enterprising this season in sampling fruit long before it has become ripe.
2. Exposure to the sun, which has resulted in sun-scald, and consequent cracking of the skin.
3. Insect attack, which, on the whole, has not been common this season.
4. Fungus diseases (such as Brown Rot, &c.,) which in spite of the dry season have not been altogether absent, possibly a consequence of the past two wet summers.

The damage caused by bees has been largely increased this year owing to the dry conditions and the almost total absence of bee food.

The subject of bees attacking fruit has received very considerable attention in the United States, where honey production has become an important industry. There careful investigation has shown repeatedly that bees never attack sound fruit, no matter how soft the skin nor how juicy and pulpy the contents beneath the skin.

Some years ago Professor N. W. McLain, then in the employment of the Department of Agriculture, Washington, U.S.A., conducted an elaborate series of experiments, in which he placed sound fruit, consisting of grapes, peaches, apricots, and the like, in hives containing bees that were brought to the verge of starvation. This fruit was left in the hives day after day, but it was never once molested. Then he tried breaking some of the fruit, and in every case all such specimens were attacked by the bees sucking up the juices until nothing but a dried skin and the stones or seeds were left.

The matter has even been brought before a Court of Law, and an official of the Washington Department of Agriculture stated in his testimony that bees never punctured sound fruit, and that it is practically impossible for them to do so, owing to the fact that they have no cutting jaws like those found in the wasp and other similar insects. The plaintiff, a fruitgrower, failed to make out a case against the bees, and the latter left the Court without a stain on their character.

Experiments with Linseed, 1918.

A. H. E. McDONALD, Chief Inspector.

In view of the local demand for linseed for oil and cake purposes, and the comparatively high prices, consequent upon the increased cost of importing, trials were conducted by the Department at several of the Experiment Farms and on private properties in various parts of the State. Incidentally the trials would serve to indicate the prospects of growing the crops for fibre purposes.

Some idea of the widespread character of these trials may be gathered from the fact that they were conducted at twenty-three centres. These included Acacia Creek and Inverell in the Northern Tableland district; Breeza, Delungra, Mt. Russell, Tamworth, Narrabri, Pallamallawa, and Quirindi in the North-west; Parkes (two trials), Dubbo (two trials), Albert, Curban, Bathurst, and Cowra in the West; Culcairn, Young, Henty, and Bomen in the South-west; and at Griffith, on the Yanco Irrigation area.

Owing to the unfavourable spring all the plots, with the exception of five, were utter failures, while the yields in the others ranged from 180 to 252 lb. per acre.

The season in all cases was adverse, as the rainfall in almost every instance was much below the average. In some of the districts the total rainfall during the growing period was fairly good, but the spring proved abnormally dry. This had a serious effect upon the linseed, whereas wheat, despite the hard conditions, returned fair to good yields. The time of sowing varied from 19th April to 18th August, and practically all classes of soil were represented.

The accompanying table shows the yield of linseed as compared with other crops:—

Name of Experimenter.	Yield of Linseed per acre.	Height of Linseed.	Yield of other crops.		
	lb.	inches.	bus.	lb.	
H. G. M. Thackeray, Wootona, Young.	188	12	41 25	3 49	Ruakura oats. Yandilla King wheat.
H. C. Lowe, Dubbo	240	15			Not given.
J. T. Maunder, Pallamallawa	252	Not given.	10	40	Hard Federation.
W. T. Annison, Parkes ..	180	12			Not given.
R. O. Eulenstein, Gracevale, Henty.	Complete failure due to dry spring.	......	25	0	Hard Federation.
Cowra Experiment Farm ...	219	12–18	25 24	0 0	Yandilla King. Hard Federation.
Wagga Experiment Farm ...	Nil.	6–9	19 19	40 40	Yandilla King. Hard Federation.
Bathurst Experiment Farm ...	,,	6–9	Yields not yet available.		

In all returns, with the exception of those mentioned in the table, the linseed is reported to have failed.

For fibre purposes the linseed practically failed in all cases, as the height in no case exceeded 18 inches, and ranged down to 4 inches.

The season was, generally speaking, the most adverse for a considerable time, and therefore it cannot be said that the results are definite. Under normal conditions better yields would doubtless have been obtained.

VINEYARD NOTES FOR MARCH.

In the earlier districts vintage will be over, and attention can be given to many things which had to be neglected during the rush of work at picking time.

Now that the vines have brought their crop to maturity they have to complete the ripening of their wood. This process has been largely neglected in the past in favour of the more urgent task of ripening the fruit. It will be noted that in spite of the dry conditions the seeds are matured at the expense of the pulp or juice of the grape. This is nature's law because the seed is necessary for reproductive purposes when the plants are growing in a state of nature. The reproductive portion being safe, the vines will next ensure a sufficiency of matured wood for a vigorous continuity of life next year. The leaves are now used for the elaboration and storage in the wood of those substances needed for the proper ripening processes to continue. The wood generally changes in colour and texture, becoming harder and more fibrous. Further, the pith of the canes is utilised as a medium for storing up reserves of plant food for the use of the vine in the early days of next spring. We know that the vine bursts its buds very early, and before the root system becomes active. So-called "bleeding" of vines when the buds are swelling is a common phenomenon to all vignerons. Nature stores in the vine quantities of water and air during the winter months. In early spring the warmth of the sun expands this water and air, and, as it has no outlet, it becomes under pressure. Cut or break a shoot and there is at once an outlet made, with the result—bleeding or loss of sap. Failing such an outlet, this pressure or energy is used by the plant to develop its growth, the pressure driving the sap containing the stored food material from the pith into the young canes. As growth develops the internal pressure is removed by evaporation, and breakage of a branch shows no bleeding By this time the root action is working and growth develops along normal lines. It is for this reason that late-pruned vines which have bled freely, are always slow in bursting their buds. They must wait until the root system is able to supply their needs.

The lessons to be drawn from these facts are, do not neglect the vines because their fruit is gathered, and do not turn the stock in to eat the leaves. The chances are that the stock will not starve for want of this food, but it is certain that the vines will starve if the stock are turned in. As the vine finishes with its leaves, it withdraws all nourishment and sheds them naturally.

Now is the time to consider the question of growing cover crops for green manuring. Where vines are planted wide enough apart, the growth of some succulent green crop and ploughing it into the soil is an excellent way to increase the fertility and moisture-retaining capacity of the soil. For preference, peas, vetches, or other leguminous crops are used.—H. E. LAFFER, Viticultural Expert.

Poultry Notes.

MARCH.

JAMES HADLINGTON, Poultry Expert.

MOULTING among adult stock will now be fairly general. Some will have already got over it. These are the sorts that are worth keeping an eye upon, for they generally represent the poor or low average layers, while those that have not yet started to moult generally represent the high producers. Usually six weeks to two months is occupied in losing the old and getting the new coat of feathers. There is, however, another class that takes very much longer to moult, from the fact that they moult slowly and continue to lay perhaps nearly the whole period while changing their coat ; these will be recognised by the new and old feathers appearing all over the body at one time, and the hen is perhaps rarely in bad feather at any time. What may be termed the phenomenal layers, the 250 to 300-egg hens, are generally found among this class. Thus a poultry-keeper at this time of the year could almost classify his hens into high class, good, and poor layers. There will, of course, be some exceptions, particularly among very aged hens, or those of poor constitution, that perhaps "hang" in the moult from sheer inability to make new feathers. These will not be difficult to detect, from the fact of their appearance indicating a poor state of health.

What to use as Breeding Stock.

If the aim is to keep up a good standard of physique as well as a good average egg-production, the hen that lays well down to the middle of this month and moults during the following two months, finishing up from the middle to the end of May, is, probably, all things considered, the best to use as a breeder. She is then fit to pen up, and although she probably will not start to lay right away, there is a much better chance of early eggs from her than from any of the other classes, except the one that never properly moults her feathers at all. The latter is a rather doubtful subject as a breeder of the class of stock the above proposition aims at. The very late moulter that lays right down to June before she casts her feathers may be a wonderful layer, and, of course, a most valuable unit as such, but she is generally disappointing as a breeder.

A Useful Tonic.

Douglas' mixture is a useful tonic during the moulting season. The method of making and using it is as follows :—Take 4 ounces of sulphate of iron and 4 ounces of Epsom salts ; dissolve in 1 gallon of boiling water ; let it cool, then add half an ounce of what is sold by the chemist as dilute sulphuric acid ; bottle and put away. One teaspoonful of this mixture might be added to each pint of drinking water ; this might be used three or four times per week for three or four weeks at a time. Great care is necessary when handling sulphuric acid. It should be poured slowly into the mixture, and only earthenware vessels should be used when preparing the stock mixture. No special drinking pots are necessary, for the small amount that is used in the water will not damage iron vessels to any appreciable extent. The case is different with tin-ware, such as kerosene tins, for they are readily destroyed by the use of Douglas' mixture owing to the occurrence of what are known as pin-holes in the tin.

Poisons.

The most common causes of poisoning among poultry are ptomaines, toxins, and common salt. The symptoms in each of these cases are much alike, so much so that probably the layman will not be able to diagnose the cause; but investigation into the methods of feeding and an examination of the foods will generally lead to a correct diagnosis of the trouble.

The symptoms generally present are those common with gastritis and enteritis. The fowl becomes droopy and refuses food and digestion becomes arrested. This can be seen by the fact the crop will often contain food for days together, although the bird is not eating. Diarrhœa is usually present. There may be a large number of deaths or a very few, according to the severity of the trouble; but usually the fatalities are comparatively few, though most of the birds will be so affected as to put them in a precarious state of health for some considerable time, in consequence of which they will go off laying.

Ptomaine poisoning arises from putrefaction of various kinds of albuminous matter, and toxins are formed by pathogenic bacteria. The danger to poultry lies in cooked meat, meat meals, or blood meals. The chief danger is cooked offal that has been allowed to ferment, as it will do if left to stand after cooling. The same thing may come about through careless handling in the preparation of meat or blood meal; toxins may also be formed in well-prepared meals if they are allowed to get damp. Whenever lumps are found in a meat meal, it may be assumed that it has been exposed to dampness. In all such cases it is wiser to use the meal for manurial purposes than to run the risk of poisoning the fowls.

It should be understood that no amount of cooking is of any use to get rid of these poisonous substances once they have been formed. This is where the poultry-farmer is often found making a mistake. He is very apt to think that all deleterious matter is rendered innocuous by cooking.

There appears to be no useful practical antidote to this class of poisoning in poultry. The only thing to do is to stop feeding the suspected articles and treat as for diarrhœa.

Salt Poisoning.

In the case of poisoning by common salt, the trouble arises not from a moderate use of salt, which is very necessary, but from its excessive use, or from it being imperfectly mixed with the food. Hence the advice frequently given in these notes that salt should be dissolved in the water with which the food is mixed. When undiluted salt, even though in very small particles, comes in direct contact with the crop of the bird it acts much in the same way as a corrosive poison, destroying the lining membrane.

Deaths from Various Causes.

The beginner in poultry-keeping is often unduly alarmed at the occurrence of a few deaths among his birds. It is as well to remember that with the short life of poultry the percentage of deaths must of necessity appear high. Then, again, poultry suffer from many ailments, the true nature of which can often only be revealed by post mortem examinations. Amongst these may be mentioned cysts, tumours, ulcerations, ruptures, &c. Even if it were possible to diagnose these troubles during life, very few would be saved, or from an economic point of view would be worth saving.

Blackhead, or Entero-Hepatitis in Turkeys.

Blackhead is a disease of the intestines and liver, which is most frequently met with in turkeys, but which occasionally attacks common fowls. The symptoms of blackhead are most frequently seen in young turkeys, commonly called "poults," which are from two weeks to three or four months old.

The subject has been investigated by Dr. Salmon, of the Washington (U.S.A.) Department of Agriculture, and much valuable work done, but further inquiry seems necessary before the actual causes of the disease can be definitely identified.

The affected birds at first appear less lively than usual, are not so active in searching for food, and when fed show a diminished appetite. Diarrhœa is a nearly constant symptom, being due to the inflammation of the cœca (*i.e.*, two blind pouches or lateral extensions along the alimentary canal). As the disease progresses there is more dulness and weakness, the wings and tail droop, and there is often the peculiar discoloration of the head which has led to the disease being called "blackhead." There is increasing prostration and loss of weight; the affected birds, instead of following their companions, stand about in a listless manner, indisposed to move, and paying little attention to what occurs about them.

The greater part of the affected poults die within three or four months after hatching, but with some the disease takes a more chronic form and does not cause death for a year or more. Nearly all die sooner or later from the effects of the disease, but in a small proportion of the cases there is healing and recovery.

The finding after death, in young turkeys, of the diseased and thickened cœca, plugged with cheesy contents, together with the yellowish or yellowish-green spots in the more or less enlarged liver, are sufficient indications to warrant a diagnosis of blackhead.

Treatment of affected birds has not given satisfactory results. The remedies most often used are—(1) sulphur 5 grains, sulphate of iron 1 grain; or (2) benzonaphthol 1 grain, salicylate of bismuth 1 grain; or (3) sulphate of iron 1 grain, salicylate of soda 1 grain. These remedies should be preceded and followed by a dose of Epsom salts (10 to 35 grains) or of castor oil (½ to 3 teaspoonfuls). Fifteen grains of catechu to the gallon of drinking water may also have a beneficial effect. It seems clear, however, that it does not pay to doctor sick poults, and that the only hope of success at present lies in preventing their infection.

The measures of prevention which have been suggested are (1) obtaining eggs from birds believed to be healthy; (2) wiping the eggs with a cloth wet with alcohol (80 to 90 per cent.) before they are placed in the incubator or under the hen for hatching, to remove any contagion that might be on the shell; (3) hatching in an incubator, or at least removing the eggs from under the hen a day or two before hatching would occur, wiping with alcohol, and finishing in an incubator, in order to avoid exposing the poults to the hen; (4) placing the young poults on ground which is at a distance from all other domesticated fowls, and which has not recently been occupied by other fowls.

BORDEAUX MIXTURE *versus* BURGUNDY MIXTURE.

AMONG the most efficient fungicides these two copper solutions take a leading place. Burgundy mixture, or copper soda, has many advocates, owing to the considerable freedom from nozzle troubles which its use ensures. But in the opinion of Mr. F. de Castella, the Victorian Government Viticulturist, Bordeaux mixture presents many advantages over it which outweigh this freedom. Among these advantages may be mentioned greater adherence, less tendency to burn the foliage, less depressing action on vegetation generally, and slower deterioration after mixing, especially in hot weather. Another advantage of Bordeaux is its suitability for the addition of casein to increase its spreading power.

ANNUAL STUD STOCK SALE AT HAWKESBURY AGRICULTURAL COLLEGE.

THE Annual Stud Stock Sale at the Hawkesbury Agricultural College will be held on Friday, 11th April, at 12 noon, when twenty-one Jersey cows, five Jersey heifers, seven Jersey bulls, two Red Poll bulls, and forty-two stud pigs (including Berkshires, Middle Yorkshires, Large Yorkshires, Tamworths, and Poland-Chinas) will be disposed of by Messrs. Badgery Bros. and Mr. Guy F. Wright, Auctioneers, in conjunction.

The train is timed to leave Central Station for Richmond at 8.55 a.m., and buyers can return by the 4 p.m. or the 8 p.m. train. Luncheon will be provided at the College.

Catalogues and further particulars can be obtained from the Auctioneers, the Principal of the College, or the Under Secretary and Director, Department of Agriculture, Sydney.

Agricultural Bureau of New South Wales.

Suggested Subjects for Bureau Meetings.

It sometimes happens that, owing to some inadvertence, or perhaps the failure of the writer of a promised paper, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion :—

What quantity of seed is sown for wheat, oats, and barley in your district? What differences do you make in quantity of seed as between one variety and another, and as between early and late sowings? Under your special conditions do you find it advisable to give a heavy sowing or a light one, remembering, of course, that in certain districts 55 lb. to 60 lb. is a heavy sowing, and in others 45 lb. to 50 lb.?

What has been the general experience with regard to superphosphate in your district? What quantity do you sow on your own farm, and have you any reason for thinking that a little more or rather less would be profitable?

Do you make more than one grade in packing your apples? If so, what do you grade for—size, colour, quality, freedom from disease, or what? Do you brand the outside of the case with the number of apples contained therein, and have you found any advantage in doing so?

What methods of cultivation are favoured amongst growers of wine grapes in your district, with the special object of absorbing and conserving the winter rains? Have you tried ploughing not less than 6 *inches deep in the months of May and June, and have you observed any advantage over the commoner practice of a shallow ploughing in autumn?*

Which do you prefer—to run the herd bull with the cows or to paddock him separately? If the bull is run with the cows, how do you regulate the flow of milk to the season? It is generally considered that the spread of disease is limited by paddocking the bull, by preventing him from serving cows that are "holding the cleansing." Have you had any experience that supports that view?

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Batlow.

The Secretary reports that the demonstration of summer pruning by Mr. J. T. Moody, Assistant Fruit Expert, in December last, and his lecture at night, were very much appreciated.

The membership of the branch is being well maintained.

Cardiff.

The monthly meeting of members of this branch was held on 11th January, when there was again a large attendance. The subject for discussion was the most suitable varieties of plums to grow in the district. After an animated debate the following varieties were chosen :—Early varieties : Edwards' Seedling, Santa Rosa, and Tibbitt's Seedling; Mid-season : Burbank and Sultan; Late : Satsuma, Balleana, and Loutherborough.

Glenorie.

A meeting was held on 25th January, when a discussion took place in connection with the Fruit Commission's report, to the effect that there was room for further improvement in grading and packing. The meeting was agreed that the majority of fruit that was sent to market from the district was properly graded and packed. It was considered that the poorly packed and graded fruit sent to market was the reason for the practice of buying and repacking before the produce reached the retailer.

Inverell.

The annual meeting was held on 10th January, with a very good attendance. The election of office-bearers for the ensuing year resulted as follows:—Chairman, Mr. G. H. Arkinstall; Vice-Chairmen, Messrs. J. Ditzell, W. Jack, and C. Lenthal; Hon. Secretary and Treasurer, Mr. W. Kook; Auditor, Mr. H. T. Knapton.

A lecture was given by Mr. W. le Gay Brereton on fruit drying, his recommendations being similar to those conveyed in the lecture at Tingha during the same week, as reported in connection with that branch.

Kellyville.

A meeting was held on 1st February, fourteen members being present. The branch has been devoting all its time and energy to the preparation of an exhibit for the local show, which, however, has been postponed owing to the outbreak of pneumonic influenza.

Lidcombe.

A lecture was given by Mr. D. G. Stead, Director of Fisheries, on 13th January, the title of the lecture being "Eggs and Hatcheries of Fishes." A fine collection of slides of deep-sea, coastal, and river fishes was screened, and much interesting and useful information was afforded as to the class of fish farmers might get established in dams and streams in the district.

Lisarow.

On 20th January a meeting was held, ten members being present. An article on preparing vegetables for exhibition was read by Mr. H. J. Rumsey, and discussion on the subject followed. The exhibit staged by this branch at the Gosford show secured third place, which was considered very satisfactory, especially as it was the first attempt made by members.

Middle Dural.

At a meeting on 17th January, the question asked in the December issue of the *Agricultural Gazette*, "What varieties of fruit do you consider the best for your district on a purely commercial basis?" was discussed. The reply framed was: This district is chiefly devoted to citrus culture, and the following varieties are recommended for planting, viz., Emperor mandarin, Lisbon lemon, Valencia, Joppa, and White Siletta oranges, Wickson's Seedling and Shiro early Japanese plums, Loutherborough, Tibbitt, Angelina Burdett and Diamond dark plums, Ruby Red, Elberta, and Wiggins peaches.

A meeting was held on 24th January, when a general discussion took place on the report of the Executive of the Fruitgrowers' Association. The following resolutions were carried:—(1) That this branch views with extreme satisfaction the Department of Agriculture's method of appointing Fruit Inspectors; (2) that the matter of improving the system of marketing and distributing fruit, grading, packing, &c., be left with the Chairman, pending a conversation with the committee appointed by the Fruitgrowers' Association to deal with this matter.

Moss Vale.

The monthly meeting of this branch was held on 24th January, when the main business was the arrangements for the forthcoming competition and drawing up a programme for the year. It was decided to apply to the Department for lectures and demonstrations on sheep and wool, strawberry growing, pasture grasses, and poultry.

Nimbin.

The annual meeting was held on 21st December, the Chairman, Mr. R. Gall, presiding.

The Treasurer's statement disclosed a credit balance of £1 13s.

The Secretary's résumé of the past year's work showed that during the year nine meetings were held. The discussions on various farming matters and the exchanges of views had been both interesting and helpful to members. In May last the herd-testing unit, which had been carried on in conjunction with the Bureau, was closed down, owing to the tester's resignation, and the inability to get another on account of so many testers having enlisted for active service. The branch competed in the district exhibit section at the recent Lismore show, and won first prize—the second year in succession. The membership roll had not been nearly as strong in the past as it should have been, but several new members had recently joined, and others had signified their intention of joining.

The members, in conjunction with other residents of the district, are endeavouring to bring about the establishment of an agricultural society in Nimbin.

Tallawang.

At a meeting of members of this branch on 10th December, the Secretary read a communication from the State Wheat Board stating that farmers supplying wheat to agents of the pool could, upon making request to that effect, have a fair sample taken, sealed, and sent to the Board's office in Sydney to be valued on comparison with the f.a.q.

Another communication stated that, owing to shortage of material, only two of the new chondrometers could be made in time for this season's operations. These would be retained by the Board as standards from which other machines would be checked and adjusted.

Tallong and District.

A demonstration of summer pruning was given on 13th December by Mr. J. T. Moody, Assistant Fruit Expert. There was a large audience present to hear the lecturer's experiences, which proved very interesting and instructive.

The usual monthly meeting of the branch was held on 1st February. The principal business was the formation of a committee to inspect orchards in the district, and report as to the desirability of competing at the next Royal Show in the pyramid of apples.

Tingha.

A lecture was delivered by Mr. W. le Gay Brereton, Assistant Fruit Expert, on 7th January.

Fruit Drying and Preserving.

Mr. Brereton commenced by stating that all fruit for drying required to be dead ripe, but not squashy, the difficulty being to let it hang sufficiently long on the trees without birds and insects attacking it.

The best method of gathering was to spread a sheet under the trees and gently to shake the branches, when the ripe fruit would fall. The sheet, made of chaff or corn bags, had a slit open to the middle, so that it could be fitted round the trunk of the tree. This necessitated going round the orchard several times, and no doubt increased the labour, but it gave a more even sample than hand picking.

Having gathered the fruit, it was removed to a table for treatment. With apricots the fruit was taken between thumb and forefinger, and a knife run round the suture, inserting the point at the stalk end, and the pit removed. For this a short shoemaker's knife would be found very handy. This was the best time to grade the fruit, placing it according to size and quality. It was then placed, cup upwards, in regular rows on trays, the pieces just touching each other, and removed to the sulphur room, where it was left for eight to twelve hours, or until the cup was almost full of juice. For household purposes, the sulphuring could be carried out by using a large packing case, wide enough to cover the trays, and high enough to allow several trays to be stacked one above another, so that they could all be done at the one time. A level piece of ground should be chosen, and a small hole dug in which to place the sulphur pot. The stacked trays should be placed over the hole, the sulphur pot put in the hole and lit, and the whole then covered with the packing case, which should be well lined with paper to prevent the fumes escaping too rapidly; 1 lb. of sulphur was considered sufficient to fumigate 200 cubic feet. The amount to use for a packing case would depend on its cubic contents. The operator would soon become familiar with the amount of sulphur required for his sulphuring chamber.

On being taken out of the sulphur room the trays were spread out on the drying greens, the period depending on the weather, but generally ranging from three to six days. Hot, dry nights hastened the process. If the weather was cloudy or wet, the trays were carefully stacked up and adequately covered. When the fruit was sufficiently dry (which was indicated by its being firm, yet pliable, with no free moisture showing if broken across) it was removed to the sweating boxes to even up and mature, the extra dry fruit absorbing moisture from that not so dry and so producing an even sample. When this was complete the fruit should be carefully packed in bags to prevent its infestation by moths and weevils.

If apricots were to be dried whole, they were first dipped in a boiling solution of 1 lb. caustic soda to 8 gallons of water. This should produce small cracks in the skin. If the cracks gaped, either the solution was too strong, or the fruit had been left too long in the solution. The sulphuring should then be for a shorter time; the subsequent process would be as for pitted fruit. For pitting apricots whole, a pitting spoon with small teeth at the end was used. It was inserted at the stalk end, and the teeth, catching behind the stone, enabled the pit to be easily and quickly removed.

As a rule, early apricots were not suitable for drying, the mid-season and late varieties, which possessed a deep apricot colour and firm and meaty flesh, being best. Moorpark, Hemskirke, and Trevatt were the best varieties for drying.

With peaches, the best varieties were freestones with firm yellow flesh, such as Elberta, Salwey, and Crawford. They should be treated as advised for apricots, the only difference being that the cup did not fill with juice during the sulphuring.

With prunes the best varieties were Robe de Sargeant and Prune d'Agen. The Giant Prune dried too light in weight, while sufficient data was not yet to hand as to the suitability of the Silver Prune. Of other plums, Angelina Burdett was the most suitable. It was a good cropper and made a heavy prune, though not quite as good as the first two, but it had the advantage of being a dual-purpose fruit, for it was also a choice dessert variety.

Prunes required dipping in a boiling solution of 1 lb. of caustic soda to 10, 12, or 15 gallons of water, the strength varying, as seasonal conditions produced a tender or a tough skin. A few should be dipped at the outset to ascertain the correct strength. In the Young district the fruit was gathered as it fell to the ground, but it could be shaken from the tree as recommended for apricots; it should never be hand-picked. The prune dried better in the evaporator, but could be dried in the sun. It was then put into sweat boxes to even up and mature. If broken it should be pliable and have no free moisture showing. It was then again dipped for three or four minutes in boiling water, or in a thin syrup made by adding a few broken prunes. As this softened them, they required careful handling, but the second drying soon took place. Ordinary wheat sacks were being increasingly used, instead of sweat boxes, for maturing the fruit.

Dried fruit was generally packed in 28 lb. boxes, neatly lined with white paper, and faced up, then pressed and nailed. The face-up should not be done with extra quality fruit, but should be typical of the contents.

Grapes for drying fell into four classes, namely, dessert, lexia or pudding raisins, sultanas and currants. Dessert raisins were made from picked fruit—the best berries of the best bunches, and the fruit must be dead ripe.

The general tendency was to pick too soon. The Gordo Blanco was usually fit to eat a week before it was ripe enough for drying. For dessert they must not be dipped in solution, as it would destroy their fine bloom, but they were dipped when making lexias. They were best sun-dried, and when one side was done they should be turned.

For sultanas dip in lye of 1 lb. caustic soda to 10, 12, or 15 gallons of water. It was well to test with a bunch to see that the solution was the right strength. Dipping could be done in kerosene tins, cut lengthways, and well pierced with holes; but it was difficult to dip evenly, as some dip lay in the bottom, so that the underneath fruit was generally overdipped. The most satisfactory vessel was made of galvanized hoop-iron in bucket shape, covered with strong galvanized wire gauze. When tipped out on the tray a piece of batten was used to spread the fruit evenly, and big bunches were generally cut to facilitate drying, which took three or four days. Currants were not dipped.

The colour of the finished product was influenced by the type of soil on which it was grown. For instance, Gordo Blanco, on light, loamy soil, dried a golden colour, but on heavy soils was brownish when dry.

After drying the fruit was stemmed and graded, and then neatly packed in 56-lb. boxes.

Apples differed from most fruits in that almost any mid-season or late apple would produce a satisfactory dried sample, though varieties like Granny Smith, Stone Pippin, London Pippin, and Dunn's Favourite produced the best quality dried fruit. Any sound reject apples might be used; so that in the case of the apple, drying was practically a means of using a by-product which otherwise would be wasted. Other classes of fruit differed from apples in the fact that only certain types were suitable, and they must be of good quality. The apples should be peeled and cored, then sliced and dropped into a weak brine, about as salty as soup. They must not be left in this longer than twenty minutes, or they would become too salty. Then they were sulphured for twenty minutes, or thirty minutes if not brined, and then evaporated. Apples particularly required sweating in order to even up. Pears were better peeled before drying, otherwise the process required too much time. Williams' was the most suitable variety.

The equipment necessary for preserving fruit was as follows :—

(*a*) Cooking bath, such as a boiler, pan, or kerosene tin cut lengthways.
(*b*) A table for working at.
(*c*) A packing table for rinsing and sorting fruit. An enamel dish generally served for this.
(*d*) Cans or bottles.
(*e*) If for cans, soldering outfit.

The aim in preserving fruit was to use heat to kill the germs which caused decay, and then to seal hermetically to prevent fresh germs from gaining entrance. The boiling point of water was a sufficiently high temperature to effect this. Jars should be carefully examined, the finger being lightly run around the seating for the rubber band. If ridgy or uneven, it should be rejected at once. Then the finger should be run lightly around the edge of the cap which fitted on to the rubber band. It also should feel smooth and even. Then the cap should be placed on the bottle without the rubber, to test whether it fitted evenly and firmly. If wobbly or rocky it should be rejected. The rubber bands next needed attention. If they were at all perished it was wise to procure fresh ones. Much of the poor condition of many preserves was directly traceable to the use of defective apparatus.

Of peaches, varieties like Pullar's Cling, which were firm and had no red around the stone, were the most suitable. The variety named developed a superior flavour after preserving. For household use, firm freestones were generally preferred, as they pitted more easily, and varieties which had red about the stone were generally avoided as they stained the syrup, thus detracting from the appearance of the finished article. For canneries the firm clingstone varieties were most in demand.

The fruit required to be ripe—a firm, not a soft ripe. It should be dipped in caustic soda solution (about $\frac{1}{2}$ lb. to the gallon) and then into cold water, when pressure with finger and thumb would cause the skin to slip off easily. This was preferable to peeling, as the latter left the surface ridgy, whereas the former method left it smooth and round. The syrup generally used was composed of 3 lb. best crystal sugar to 1 gallon of water. The jar should be filled with peaches, being packed carefully around the sides, and syrup poured in till the jar was full. The cap should then be put on without the rubber ring, brought to the boil and boiled for twenty-five to thirty minutes. More syrup should be ready heated to the boiling point and the rings sterilised by dipping in boiling water. The lid should now be removed, the rubber fitted, and the jar filled to overflowing with boiling syrup. Finally it must be capped and sealed down. When cool, each jar should be tested to see if it was air-tight.

If hot syrup was to be used a wet cloth should be wrapped round the bottles when filling to prevent cracking, and they should be placed in hot water, not cold.

Canned or bottled fruit improved in flavour by being stored at least six months, the only exception being when the fruit was preserved unpitted, the stones having a tendency to make the preserves bitter.

The later apricots were used ripe, but firm, not "mushy." They should be treated as peaches, but only boiled for fifteen minutes. Pears must be thoroughly ripe, but not "smashy." For Williams, 1½ lb. of sugar to 1 gallon water was sufficient, but Kieffer and China required a syrup of 3 lb. to 1 gallon. Pears should be peeled and cut into quarters or eighths. Kieffer and China should be kept until yellow before preserving, and they then made a fine article.

Only the finest Robe de Sargeants were used for dessert prunes, the Prune d'Agen being used as a cooking plum. After treatment by drying they were packed in cans or jars, a teaspoonful of water added and then cooked in the bath for twelve hours at boiling point. The tins were then inverted to flatten the top prunes against the lid, thus improving appearances when opened. Preserved prunes were improved by being stored at least six months.

Plums were seldom pitted. They were difficult to get up for show, the tender skin splitting and fruit becoming ragged, so only slight cooking was given. Greengage, Coe's Golden Drop and Satsuma were good varieties. The blue plums were not so suitable.

Tomatoes could easily be preserved to furnish dainty dishes for the off season. Instead of sugar a weak brine—salt enough for soup—and a little vinegar were used. Select ripe, well coloured, firm tomatoes. Wash and remove the stalk without injuring the fruit, pack, cover with brine and cook for seven or eight minutes, and treat as previously advised. To avoid injuring the fruit the stems were often cut, leaving the green calyces on the fruits.

Quinces should be firm and yellow. Rinse, peel, core and cut into fourths or eighths. Use three to one syrup, and cook forty-five minutes. For show purposes long cooking gave a fine red colour, but spoiled the syrup, so the discoloured syrup should be poured off and replaced by clear syrup, after which it should be reboiled for about three minutes and sealed.

Gordo Blanco and White Muscat of Alexandria were the most suitable varieties of grapes. A syrup of 1½ lb. of sugar to the gallon should be made, and the fruit cooked about ten minutes and sealed. These fruit improved greatly when stored for six months or longer.

When the rush of the harvesting season was on, pulping would keep the fruit until later in the season, when there was more time to make jam. For wet pulp proceed as in canning, only use water instead of syrup. For dry pulp, rinse, slice and add a small quantity of water to prevent burning. Cook till thick or a loss of about one-third of its weight and seal thoroughly. This was a better method for apples than drying.

A meeting was held on 1st February, when it was decided to call a public meeting to discuss the question of railway connection with the North Coast. It was also decided to compile monthly "gardening notes" for the guidance of members and residents generally, and to ask the proprietors of a local newspaper to publish them.

Toronto.

The annual meeting was held on 10th December. The election of office-bearers resulted thus:—Chairman, Mr. H. Filmer; Vice-Chairman, Mr. J. Cockburn; Treasurer, Mr. L. Owen; Hon. Secretary, Mr. J. Froome; Auditors, Messrs. Walker and Martin. The balance-sheet showed a credit balance of £10 19s. 5d., and the report indicated a healthy state of affairs, the membership having increased from eight two years ago (when the branch was the subject of little interest) to thirty-two, with promises of further development. The practice of visiting the farms of members in turn had proved educative and interesting.

At a further meeting on 7th January it was agreed that the continued dry weather made the cancellation of the show unavoidable.

Valla.

A meeting of the members was held on 4th January, when a discussion took place on the cultivation of potatoes.

At a meeting of this branch on 3rd February a discussion took place on the burning of paspalum grass paddocks.

Mr. Henderson believed in firing new paddocks for the first four or five years; after that, he thought it was inadvisable.

Mr. Coleman advised burning new paddocks every year for a few years, and then every two or three years. If a pasture was fairly bare it was unnecessary to burn, but if there was a quantity of old rank grass, then it should certainly be burnt off, as milking cows did not thrive on dried-up feed.

Mr. Steele believed in burning paddocks every three years, and advised burning after light rain so as to ensure only a light fire. A hot fire over red soil was too severe on paspalum, and often killed a big proportion of the grass. Burning should be done in the spring. He found that the yield of milk from his cows increased when they were turned on recently burnt pasture with a nice young growth of grass.

Mr. F. Wyatt did not like firing his paddocks; he considered he had spoilt two of his paddocks by burning them.

Wetherill Park.

A meeting was held in December, when a discussion took place on the coming fruit crop, and various other matters. At their next meeting it is the intention of the members to discuss some of the questions appearing in the *Agricultural Gazette.*

Windsor.

The meeting on 17th January, which was the largest the branch has yet had, made arrangements for a social gathering to celebrate the completion of the first year of the branch's existence.

The subjects suggested in the December issue of the *Agricultural Gazette* were discussed, and a brief report follows.

Do you consider the natural grasses on your farm sufficient for profitable dairying all the year round?

Mr. J. Greentree was quite certain that holdings in this district really had no natural grasses in the true sense of the word. There were many grasses useful in their way as pasture grasses, but they were not sufficiently profitable as food producers for the dairy farmer to be wholly dependent on them. Couch grass was very useful for both milking and fattening cattle.

Mr. A. C. Greentree concurred, and said that they might also add White clover and Bull grass. For the winter Prairie grass was valuable. *Paspalum dilatatum* was not regarded as a good dairy grass locally, owing to its coarseness when not well grazed. Cattle would not eat it when they could get other grasses. The dairyman, to make a success of the business in the district, must not place any reliance on natural pastures, but should cultivate his land, grow cereal crops and lucerne, and should hand-feed freely. The results from natural pastures were not comparable with results from hand-feeding. He recommended lucerne and maize as summer fodder (green), and Cape barley and Algerian oats as winter feed. This, with a little conserved fodder, should meet the year's requirements. Sorghums were not favoured for milking feed.

Mr. J. Greentree believed in the growing of vetches in hay crops, especially among oats. He had seen a crop of oats and vetches (with two-thirds the usual quantity of oat seed and the vetches then added) yield a heavier crop of superior hay than the crop without vetches. The only disadvantage was the mowing of the crop, the vetches being "viny." Nevertheless, he regarded the mixed crop as preferable.

What birds common in your district do you consider most valuable from the producer's point of view?

Mr. J. **Greentree** said that the starling, according to what he had observed, was the best insect destroyer. Others that he knew of were the ibis, kookooburra, and swallow.

Mr. **James Gregory** had seen the wagtail destroying the larvæ of codlin moth, and the jacky winter and soldier bird were frequently seen destroying insects.

Mr. **John Armstrong** said that the mudlark and skylark were valuable insect destroyers.

Mr. **George Davis** mentioned the Durban magpie as one of the best insectivorous birds.

Mr. J. C. **Griffiths** remarked that flying foxes were fast becoming a serious nuisance to fruitgrowers, and that some steps should be taken to destroy them in their haunts. It would only be fair to the fruitgrower if the Government would organise shooting parties supplied with free ammunition to raid their camps when and wherever they were found, the fruit inspectors in the district to have charge of the arrangements and locate the camps.

What varieties of fruit do you consider the best for your district on a purely commercial basis?

Mr. T. **Gregory** said that he had found that the Australian Navel orange (often confused with the Washington navel) was a very shy cropper and most unprofitable. Jaffa was an orange that should not be planted for commercial purposes, owing to it cropping heavily in alternate years, and producing fruit of an inferior quality that fell easily.

Mr. A. C. **Greentree** said the Canton and Beauty of Glen Retreat mandarins were not profitable with him. The Lisbon lemon had outclassed the Villa Franca with him, and he had cut back six-year-old Villa Francas and reworked them to Lisbon, and the result was a great success.

Mr. E. **Kingham** said that the best commercial orange for the district was Late Valencia.

It was generally agreed by members that the following varieties of fruits were the best to grow for commercial purposes in the Windsor district and its environs—citrus fruits for the highlands, and stone and citrus fruits for the lowlands and river flats. The best varieties of citrus fruits to grow on the highlands were: Oranges—Late Valencia, White Siletta, Common, Joppa, and Washington Navel; Mandarins—Emperor; Lemons—Lisbon. The Washington Navel should be worked from trees known to be good croppers and thrifty, and the wood should be taken from trees growing in the locality, of which many were very prolific and were the only reliable ones, as experience had taught many growers.

The hour being late, discussion on stone fruits was deferred.

Woonona.

This branch's annual show was held on 11th January, when the display was surprisingly good, notwithstanding the season. Fruit, vegetables and flowers of excellent quality were staged, which illustrated that there was no need for the district to send money elsewhere, at any rate for the first two lines.

At the opening of the show the Chairman, Mr. E. Cameron, remarked that the membership had exceeded 100, and Mr. Davidson, President of the Shire Council, in declaring the show open, congratulated the members of the branch upon their activity and the success of the venture.

Young.

At the special request of the Young Farmers and Settlers' Association to the Cunningham branch of the Bureau, Mr. B. J. Stocks, Hon. Secretary, visited Young to open up a discussion on mixed farming.

The meeting, which was held on the 25th January, was attended by a large and representative gathering. A general discussion followed the lecture, and Mr. Stocks was besieged with a volley of questions, all of which were answered satisfactorily.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	A. Buchhorn, Albury.
Baan Baa	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bankstown	J. W. Cunningham, Brancourt avenue, Bankstown.
Bathurst	J. McIntyre, Orton Park.
Batlow	A. C. Arnot, Batlow.
Beckom	H. Horsburg, Beckom.
Bimbaya	J. B. Boller, Tantawanglo.
Blacktown	B. H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell).	C. A. McAlister, Bloom Hill, O'Connell.
Borambil	H. A. D. Crossman, "Homewood," Quirindi.
Braidwood	A. Page, Braidwood.
Brocklesby	J. Hunter, Brocklesby.
Buckaroo	P. J. Crowley, Buckaroo.
Bungalong	G. H. Pereira, Grenfell Rd., via Cowra.
Canadian	F. W. Taylor, Canadian Lead.
Cardiff	John Cockburn, Cardiff.
Carlingford	F. H. Harvey, Ray Road, Epping.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Clovass	W. G. Cox, Tatham.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Rowcliff, Cow Plain, Collie.
Comboyne	J. J. Dolton, Comboyne.
Coonabarabran	H. H. Moss, Coonabarabran.
Coradgery	M. J. Keik, Black Trundle Road, Parkes.
Coraki	G. A. Forrest, Coraki.
Cordeaux-Goondarin.	G. H. Walker, Upper Crown street, Wollongong.
Coreen-Burraja	—
Corowa	R. Dwyer, Corowa.
Cotta Walla	T. A. Howard, Cotta Walla, Crookwell.
Crudine	F. W. Clarke, Crudine.
Cumnock	K. J. Abernethy, Cumnock.
Cundletown	S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla.	J. D. Berney, Eurimbla, via Cumnock.
Cunningham	B. J. Stocks, Linden Hills, P.O., Cunningham.
Deniliquin	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	Geo. Turvey, Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook	W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	W. Thompson, Forest Ck., Frogmore
Garra & Pinecliff	S.W. Packham, "Clifton," Pinecliff.
Gerringong	J. Miller, Warrabank, Toolijooa.
Glenorie	J. Hutchinson, Cattai Rd., Glenorie.
Grenfell	A. A. Patterson (*pro tem.*), Grenfell.
Gunning	E. H. Turner, Gunning.
Hay	F. Headon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
Hillston	M. Knechtli, Hillston.
Holbrook	Frank F. Forster, Holbrook.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jilliby-Dooralong	K. A. Smith, Jilliby, Wyong.
Jindabyne	Sylvester Kennedy, Jindabyne.
Keepit (Manilla)	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	J. M. Firth, Kellyville.
Kyogle	J. Martin, Kyogle.
Leech's Gully	James Donnelly, Leech's Gully.
Leeton	W. J. Monfries, Farm 521, Leeton.
Lidcombe	H. Laman, Martin-st., Lidcombe.
Lisarow	A. L. Kelman, Lisarow.
Little Plain	F. S. Stening, Little Plain, via Inverell.
Lower Portland	W. C. Gambrill, Lower Portland.
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham	W. R. Crossland, Matcham, via Gosford.
Meadow Flat	T. L Williams, Meadow Flat, via Rydal.
Middle Dural	A. E. Best, "Elliceleigh," Dural.
Milbrulong	F. W. Gollasch (*pro tem.*), Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Miranda	S. J. Richardson, Miranda.
Mittagong	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya.
Moss Vale	W. G. Bale, Moss Vale.
Narellan	G. J. Richardson, Narellan.
Narrandera	James Faulkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains.
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville	C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith).	K. Basedow, Orchard Hills, via Penrith.
Parkesbourne	S. W. McAlister, Parkesbourne.
Peak Hill	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	L. S. Pieremont, Penrose.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue)	E. Miskle, P.O., Lue.
Quaker's Hill	C. Gardner, Blacktown.
Rawsonville	G. R. J. Hovenden, Rawsonville.
Redbank	J.J. Cunningham, Redbank, Laggan
Ringwood	Wm. Tait, Ringwood.
Robert's Creek	J. W. Morrissey, Robert's Creek.
St. Marys	W. Morris, Queen-st., St. Marys.
Sackville	Arthur Manning, Sackville.
Sherwood	J. E. Davis, Sherwood.
Speedwell (W. Wyalong).	B. Noonan, Speedwell, W Wyalong.
Spencer	H. J. Woodbury, Spencer.
Springside (via Orange).	E. H. Selwood, Springside.
Stockinbingal	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Stratford	P. H. Deards, "Loch Maree," Stratford.
Tallawang	Selwyn E. Hinder, Tallawang.
Tallong	W. Snushall, Tallong.
Tangmangaroo	A. Thompson, Kangiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, "Chacewater," Chellington, Temora.
Tennyson (North Richmond).	H. C. Croft, Kurrajong.
Thyra-Bunaloo	C. H. M. Smith (*pro tem.*), Thyra, via Moama.
Tingha	M. L. Levitt, Tingha.
Toronto	J. Froome, Knowle Farm, Toronto.
Ulan	P.S.D. Howarth, Ulan, near Mudgee.
United Peel Riv. (Woolomin).	C. J. MacRae, Woolomin.
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	E. Crouch, "Estella," Wagga.
Walla Walla	H. Smith, Walla Walla.
Wallendbeen	W. J. Cartright, Wallendbeen.
Walli	C. T. Allen, Walli.
Warner's Bay and District.	J. Raw, Fairfax-st., Spiers' Point.
Wellington	L. Jurd, Warne-st., Wellington.
Wetherill Park	A. J. Hedges, Wetherill Park.
Windsor	W. H. Spinks, Windsor.
Wollun	J. B. Anderson, Wollun.
Wolseley Park	J. G. Downie, Wolseley Park.
Woonona	H. Coltman, Woonona
Wyan	—
Wyong	Edgar J. Johns, Wyong.
Yarramalong	E. Hodges, Yarramalong.
Yetholme	—
Yurrunga and Avoca.	F. Saville, Yurrunga.

Orchard Notes.

MARCH.

W. J. ALLEN.

Harvesting.

IN the coastal districts where early and mid-season deciduous fruits are chiefly grown, the fruit season will have been completed last month. The citrus growers' harvesting operations will be confined to the marketing of lemons as they become fit. Unfortunately, the summer crop of lemons is light, due in the first place to unusually severe frosts at the end of last winter, and secondly to the very dry summer. Those that have lemons, however, should go over their trees regularly and pick any that are up to size or that are "on the turn," for if left hanging the fruit will coarsen and deteriorate in value. When lemons are scarce, and consequently the sale and consumption of fruit is rapid after it reaches market, picking or pulling is permissible, but when harvesting with a view to curing, shipping, or storing, the fruit should always be clipped from the tree, not picked or pulled.

Harvesting Apples and Pears.

The apple and pear growers on the tablelands and inland districts will be in the thick of their harvesting this month. With most varieties of these fruits it is necessary to go over the trees more than once as they do not all mature at the one time, and the earlier specimens on a tree will not hang until the later ones on the same tree are fit.

In picking some of the earlier varieties of pears, such as Williams', which will ripen even when picked very green, or some of the earlier apples as cookers, it is usual and quite satisfactory to pick as soon as the fruit has attained a saleable size. But in dealing with the later varieties, maturity must be taken into consideration. There are several indications by which this can be judged, and a decision should be arrived at by observing each. The browning of the pips, for instance, cannot be relied upon by itself, but the condition of the flesh must also be taken into consideration. The flesh when cut or bitten should have lost its woody texture and show some juiciness. When tasted there should be an indication of the sweetness and flavour (though, of course, not fully developed) characteristic of the variety when ripe. Coloured varieties should hang, if possible, till their colour develops sufficiently.

But the indication which has most influence in forming a decision as to when to pick, is the readiness with which the stalk parts at its union with the spur. Naturally, if one delays picking after this condition prevails, there is great risk of heavy loss from wind. Ability to judge the condition when to pick is very easy to acquire, and one soon gets familiar with the varieties one is handling. But caution must be exercised in not trying to generalise too much. For instance, I have already mentioned that Williams' pears may be picked very green if the price and market warrant. Packham's Triumph, on the other hand, must be allowed to hang until well matured or it will not ripen well after picking, and it will show a change from the green colour of the skin some time before it is fit to pick. It is not wise in some districts to wait for colour in such varieties of apples as Gravenstein and McIntosh Red, as they fall before developing it. With such varieties, if one wishes to leave them as long as possible to colour, the trees should be mulched with straw or dried grass and the fallen fruit picked up daily. Delicious must be allowed to hang till well matured on the tree, or its texture will remain woody and unpalatable. This apple hangs well, and the early specimens can often be allowed to hang till the later ones on the same tree are fit to pick.

A Picking "Apron."

We have found the "apron" the most convenient contrivance to pick into. This hangs on the picker, and when full, one end can be placed in the picking box and gently withdrawn, the fruit thus being transferred into the box. Some growers prefer buckets or baskets of different designs with hooks by which they can be hung on the branches or ladder convenient to the picker. Whatever receptacle is used it should allow both hands of the picker to be free, and it should always be in a handy position to receive the fruit without loss of time. Though apples and pears are generally in a hard condition when being picked, they are easily bruised. As they are removed from the trees they should be placed right into whatever receptacle is being used. A careless picker will do considerable damage by letting an apple or pear drop from the opening of an apron down on to others already in there, and also by pressing the apron whilst containing fruit against the ladder with his body. When transferring fruit from one receptacle to another or on to the packing bench, the fruit can be poured provided it is not allowed to drop, and provided the stream of fruit is continuous. If it is checked and then started again, the fruit will come with a run and bruise by bumping hard those that have gone out before.

Grading.

Generally in this State fruit is marketed under one average quality grade. That is, a pack of a certain variety from an orchard is graded into different sizes, but not into two or more different quality grades. A case may thus contain from the best to the least coloured, and only those are rejected that have some blemish that would lower their market value. Whether putting up a pack divided into two or more quality grades would show a greater profit to the producer would probably be a very contentious question among our growers. But I would like to point out that as two States, Tasmania and Victoria, both of which are heavy suppliers to our market, have adopted standard grades, New South Wales growers may find themselves forced to follow suit, or find that their fruit will only realise the same prices as the Tasmanian and Victorian "C" grade.

Packing.

We have found that the diagonal or space packing is very suitable for apples and pears and most adaptable to standardisation. The standardisation of packing undoubtedly facilitates sales, which naturally must be an advantage to the grower. A good " square " packer, once he grasps standard diagonal packing, will pack even faster than before and will prefer it to square packing.

Wrapping.

Until paper falls to reasonable prices again, wrapping is almost out of the question. Undoubtedly apples open up far better when wrapped, as it minimises stalk injury, which is unavoidable when they are packed naked. On the other hand, pears being of a different shape can be packed naked without stalk injury, and we have got as good prices for the same quality pears naked as those wrapped, in the same consignment on the Sydney and Brisbane markets. For export, of course, wrapping is necessary for both apples and pears.

Presses and Nailing.

Presses for nailing down cases should always be used. The case should just rest at its ends on the seat of the press and the clamps should only press on the ends of the lids; this allows both the bottom and lids of cases to spring or bulge in the centre when it is being nailed down. The bottom and lids should be thin enough to allow of a spring. If a press is not available one end of the case should rest on a batten while it is being nailed to allow the bottom to spring as it does in the press. There is a general prejudice against nailing in a press, but we know of several instances of previously prejudiced persons preferring the press after using it for a few days.

Stacking.

Packed cases, either with nailed or hinged lids, should never be stacked with the lid or bottom up or down, but on their sides. The spring or bulge is then on the side, and the weight of the cases above does not come on it.

Markets.

There seems every prospect of some space this season for export of fruit to England. This will mean fewer apples on our markets from the other larger producing States, and consequently more room for our own. However, too much of our inland and tableland fruits come to Sydney only to be reconsigned back to the country. Probably this faulty distribution will not be completely remedied till growers are more fully combined and have an organisation to correct this anomaly, and every effort should be made by growers to make their organisation strong enough to carry out this work systematically. But in the meantime every grower should be on the lookout for markets in different parts of the country which cannot produce the class of fruit he is growing.

Rejects.

No matter how skilled the grower may be, a certain percentage of fruit will be produced that will not pay to market fresh. Reject apples and some varieties of pears can be dried. Reject apples can also be pulped. Where growers are not too isolated, this work could be more economically done by having a central evaporating or pulping plant.

Grapes.

Grapes will still be coming in from the inland districts. These are generally picked when sweet enough, and the dark varieties have sufficient colour to suit the buyers. The later varieties, such as Ohanez (Daria) and Purple Cornichon, can be allowed to hang if the autumn is not a wet one, should prices be not attractive enough to send them as soon as they are ready.

Drying varieties, such as Gordo Blanco and Sultanas, will be ready this month. It should be remembered that both of these should be allowed to hang until they are dead ripe if they are to be dried.

Prunes.

The bulk of the prunes will be ready this month. These also should be dead ripe for drying, and should only be gathered by shaking the trees slightly or by picking up daily those that fall naturally. For further information on this subject, see Farmers' Bulletin, No. 52, " Fruit Drying," which may be obtained free on application to the Under Secretary and Director, Department of Agriculture, Sydney.

Pests.

During the busy part of the fruit season one is apt to neglect the regular picking up and destroying by boiling or burning of infested fruit. It should be remembered that codlin moth or fruit-fly do not wait until the busy time is over, and the progeny of any that escape now will attack in greatly increased numbers next season.

Cover Crops.

This month is a good time for sowing a cover crop. The land should be prepared by ploughing, and some artificial fertiliser sown with the seed to force along the crop. The object is to get as much growth as possible to plough under by the latter part of the winter. In the drier inland parts we have found rye the most suitable, but on the coast where field peas will thrive they are to be preferred, being a legume. Where no cover crop is to be sown a ploughing is beneficial, as it works the soil up after the unavoidable tramping during picking, and leaves it in good condition to receive the autumn rains.

Planting.

Where ground has been previously prepared and is in moist enough condition, it will be a good time for planting citrus trees. Ground that has been cleared for planting either deciduous trees this winter, or citrus trees in the spring, if not too hard and dry, could be broken up now. This will not only allow it to sweeten, but will also allow any rains that fall to soak in and thus be stored for the trees.

Budding.

If rain has fallen and the sap is flowing freely, it would not be too late to bud deciduous trees.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1919.

Society.	Secretary.	Date.
Bangalow A. and I. Society	W. H. Reading	Mar. 11, 12
Cootamundra A., P., H., and I. Association	N. Gardner	,, 11, 12
P. and A. Assn. of Central New England (Glen Innes)	G. A. Priest	,, 11, 12, 13
Kangaroo Valley A. and H. Association	L. W. Vance	,, 12, 13
Nambucca A. and H. Association (Macksville)	M. Wallace	,, 12, 13
Tumbarumba and Upper Murray P. and A. Society	W. R. Figures	,, 12, 13
Orange A. and P. Association	W. J. I. Nancarrow	,, 12, 13, 14
Blacktown Branch of the Agricultural Bureau of New South Wales.	R. H. Lalor	,, 13, 14, 15
Goulburn A., P., and H. Society	H. C. Fraser	,, 13, 14, 15
Wellington P., A., and H. Society	A. E. Rotton	Postponed indefinitely.
Mudgee A., P., H., and I. Association	E. J. Hannan	Mar. 18, 19, 20
Armidale and New England P., A., and H. Assocn.	A. McArthur	,, 18, 19, 20, 21
Crookwell A., P., and H. Society	P. R. Marks	,, 19, 20
Gundagai P. and A. Society's Repatriation Show	J. Gardiner	,, 19, 20, 21
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 19, 20, 21
Tamworth P. and A. Association	J. R. Wood	,, 25, 26, 27
Inverell P. and A. Association	J. T. Dale	Postponed indefinitely.
Dubbo P., A., and H. Association	F. Weston	Postponed.
Cooma P. and A. Association	C. J. Walmsley	Mar. 26, 27
Walcha P. and A. Association	S. Hargrave	,, 26, 27
Ulladulla A. and H. Association (Milton)	R. F. Cork	,, 26, 27
Hunter River A. and P. Association	E. H. Fountain	,, 26, 27, 28, 29
Taralga A., P., and H. Association	J. J. Kearney	,, 27, 28
Nepean District A., H., and I. Society (Penrith)	C. J. Welch	,, 28, 29
Dungog A. and H. Association	W. H. Green	April 2, 3, 4
Central Cumberland A. and H. Assocn. (Castle Hill)	H. A. Best	Date to be fixed.
Quirindi District P., A., and H. Association	A. Pountney	April 2, 3, 4
Camden A., H., and I. Society	A. E. Baldock	,, 3, 4, 5
Batlow A. Society	C. S. Gregory	,, 8, 9
Blayney A. and P. Association	H. R. Woolley	,, 9
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 9, 10
Royal Agricultural Society of N.S.W.	H. M. Somer	,, 15–23
Cobargo A., P., and H. Society	T. F. Kennelly	May 7, 8
Clarence P. and A. Society (Grafton)	G. N. Small	,, 7, 8
Upper Manning A. and H. Association (Wingham)	D. Stewart	,, 7, 8
Moree P. and A. Society	A. U. Ezzy	,, 21, 22, 23
Parkes P., A., and H. Association	G. W. Seaborn	Aug. 20, 21
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 26, 27, 28
Corowa P., A., and H. Society	J. D. Fraser	Sept. 2, 3
Albury and Border P., A., and H. Society	F. J. Belbridge	,, 9, 10, 11
Young P. and A. Association	T. A. Tester	,, 9, 10, 12
Northern A. Association (Singleton)	J. T. McMahon	,, 10, 11, 12
Ganmain A. and P. Association	T. S. Henderson	,, 16, 17
Temora P., A., H., and I. Association	A. W. Ness	,, 16, 17, 18

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Agricultural Gazette of New South Wales.

Pit Silage.

A. H. E. McDONALD, Chief Inspector of Agriculture.

THE drought which has prevailed for many months, and is still unbroken in some portions of the State, has again brought into prominence the necessity for the storage of feed. The usual mortality attending droughts has fortunately not occurred on this occasion. This is chiefly due to the fact that the height of its severity was in summer, and consequently stock withstood its effects better than they would have done had the weather been cold. A further reason was that water supplies held out better than during previous droughts. At the same time the loss, although not apparent to the casual observer, was very great through failures in the lambing, loss in weight and quality of wool, and the high cost of providing feed for the starving stock. Loss also occurred through owners being forced to put sheep on the market whilst in comparatively low condition.

In the days when stock were cheap the cost of carrying them through drought periods was almost prohibitive. But now, when sheep are worth from 30s. to 40s. per head, it is a good business proposition to take steps to save them, as even with feed at abnormal prices such a course is usually cheaper in the end than the cost of restocking later. Most graziers recognise this fact, and have made every endeavour to carry their stock through by paying high prices for agistment or the purchase of feed. To cope successfully with droughts, however, it is necessary that provision be made during good years, as unless this is done the amount of stored fodder in the country when dry conditions prevail will be totally inadequate. During droughts the few who have reserves of fodder are handsomely rewarded for their foresight; but if farmers could be certain of receiving for their forage each year a return which would ensure them a reasonable profit, they would be well satisfied.

A very sound policy for the large sheepowners to adopt would be an arrangement on their part with neighbouring farmers to grow and store for them fodder in normal years, with delivery to be made when the necessity arises. Farmers are often in a better position than many of the large graziers to undertake the work of conserving fodder, as they have the necessary equipment and suitable land. A great area is occupied by graziers on which it is impossible to grow crops, and relief must perforce be obtained from more favourably situated country.

It is only by some such organisation and co-operation between farmers and graziers that sufficient reserves of forage will be created and the appalling losses of stock be prevented.

One of the most satisfactory methods of conserving forage is in the form of silage, and it is the advantages of this simple method which it is proposed to describe.

How it will Benefit the Farmer Individually.

It might be stated at once that under normal conditions it is neither difficult to raise crops suitable for silage, nor is the latter difficult or inconvenient to make. The crops can be raised easily because the seed can be sown much earlier than wheat is ever sown for hay or grain, and thus grows during the most favourable season. It is not inconvenient to make, because the crop can be cut and all the work of making completed well before the usual routine of haycutting commences. There is a further advantage that the work can be done when the weather is cool; it is therefore not nearly so trying as the operation of haymaking.

A farmer to be successful must carry sheep on his land as well as grow wheat; and a good reserve of silage will not only prevent loss during droughts, but it will enable him to increase the numbers because of the reserve of feed on which he can draw should the necessity arise. Where the size and character of the farm is such that the owner finds it impossible to carry sheep permanently, except a few ration sheep, the adoption of the system of silage-making may place him in the position of being able to make use of sheep to a greater extent, and thus augment his returns.

Under present conditions it is hardly possible for a great many wheat-farmers to carry many sheep profitably, as the nature of their holdings is such that the natural grasses, even when helped by the wheat stubble, are not sufficient to provide feed for any length of time. There is no great inducement for a farmer to grow crops specially for sheep feed when he knows that he will have to wait until the crops are ready before he can buy, and at that time, owing to the abundance of grass, sheep will be so high in price that the margin will not recompense him for the cost of growing the crop.

It is undeniable that a better system of rotation is required in the wheat areas than the almost universal wheat and bare fallow, because such a practice will within a very few years so reduce the supply of humus in the soil that the yields of wheat will no longer enable a profit to be made. Such a condition is already arising in many soils, and will become more pronounced as time passes. In this country, where the rainfall is so uncertain, one of the most important constituents in the soil is humus, because it is one of the prime factors in helping the soil to retain moisture for a long period, and even the best fallowing will not yield good results in its absence.

The only practicable means of restoring or maintaining a good supply of this constituent, except by allowing the land to lie out in grass for a long period, is to grow upon it in rotation with wheat a crop which can be fed down by sheep. The remains of the plants left after the sheep, and their excrement, becomes humus which gives to the soil the desirable moisture-retaining character.

The conservation of silage will enable the farmer to adopt such a system with greater certainty of making a good profit directly from his green crops, as well as indirectly by improving the present yield, because it will place him in the position of being able to stock the land to its full capacity. Unless such a reserve is held it is unsafe to do so, as the green crops may fail to grow at the expected time owing to the absence of rain.

Further, it enables him to lamb his ewes with certainty. Should a dry season threaten at the mating time he need not be afraid to join in the usual way.

Another consideration which should weigh heavily with anyone who has to deal with stock, is the enormous load of anxiety which is lifted from the mind of the fortunate possessor of silage. The man who has a good reserve can carry his sheep along on the grass up to what may be called the last moment; and then when in the ordinary course some of the weaker ones would be dying through lack of food, he can turn to his silage with the satisfactory feeling that although things have got pretty bad he is still right for a further few months, and that it is very unlikely that it will not rain before his feed supply runs out.

The Making of Silage.

Considering all its merits, it is rather inexplicable that more silage is not made by the wheat-farmers. Apparently the chief reason is because it is thought that the making is a complicated process, in which special skill and knowledge are required. As a matter of fact, it is simpler and easier to make than hay. In haymaking a considerable amount of judgment is required, as it is easy to make a mistake in putting it in before it is properly dry. The difficulty seems to be that farmers, being used to making hay, cannot realise that good feed can be made from green, sappy material. The processes of silage-making and haymaking are somewhat analogous to fruit canning and fruit drying. If the farmer, knowing that his wife cooks the fruit and then puts it in a bottle and makes that bottle airtight, would just realise that when he puts green material into a pit it naturally cooks itself, so to speak, and that he can make it airtight by scooping some earth over it, he could go ahead with greater confidence.

If certain simple instructions are followed boldly there is practically no danger of failure.

Various means of putting up silage are used. In the dairying districts the usual and most convenient method is in a properly constructed tub silo. These vary both in shape and in the material used in the construction. It is also put up in stacks, which are generally weighted, often in ingenious ways, to exclude air and prevent loss. Even when the greatest precautions are taken, however, this is a very wasteful method, both of labour and of feed.

In the wheat-growing districts, especially where the silage is intended for sheep, the pit method is undoubtedly the best. By this means, silage can be made with the least amount of labour and with a minimum loss of material. It is not rivalled even by the most up-to-date silo, as when the latter is used the material must be chaffed, and this means greater expense in making the silage, and when it is being fed to stock, troughs of some kind are required as feeders, whereas the crop is put into the pit whole, and when the silage is taken out it needs only to be spread over clean ground for the stock.

Material for Silage.

To make good silage it is essential that the material used should contain the right amount of sap. If it is too dry it is likely to mould or to char—that is, the heat which is generated will, although not causing actual burning, produce a charred condition of the material and render it useless. If, on the other hand, it contains too much sap, a mushy, evil-smelling product will be produced, the condition being so bad in some cases as to make it valueless. Crops of wheat, barley or oats which have made good growth and have not been withered by heat or drought are in the best condition just after the ears appear. These crops, even when they have made rank growth, do not contain too much moisture. At Coonamble Experiment Farm we have made silage of extra good quality from barley, grown on black soil, which had lodged so badly through rank growth that it was extremely difficult to cut. This crop was cut before it had all eared in August, and was put straight into the pits. At Condobolin Demonstration Farm barley was also used; and at Trangie and Nyngan Farms it has been made from wheat, and in every case the silage was excellent in character.

Maize and sorghum make good silage when cut at the time the cobs are well formed in the former and when the heads are well out in the latter. Rape cannot be converted into silage owing to its great sappiness. Even stray plants of rape mixed with barley put into the silage-pit at Coonamble came out mushy and useless.

Amongst natural herbage trefoil and variegated thistles make good silage, but it is as well to let the material wilt a few days before putting it into the pit. It is doubtful whether very succulent herbage such as Crowsfoot will make good silage. It contains so much sap that it would be risky to make; but if it were allowed to dry somewhat, and could be mixed with drier material, it may turn out satisfactorily.

In the wheat-growing belt it will pay the farmer best to grow crops especially for silage, as on the red-soil country heavy growths of natural herbage rarely occur. Barley and wheat are very suitable, and crops infested with oats can be utilised.

In raising crops for silage, early sowing should be practised. By doing this a heavier growth is usually obtained, as advantage is taken of the early autumn rains, and in addition the crops can be handled before haymaking is due. In many cases the most satisfactory crop is Cape barley, as it makes a very strong growth and gives a big yield.

Making the Pits.

The practice we have followed is to make pits to hold about 100 tons each. It is better, where up to about 1,000 sheep are to be provided for, to make the pits this size rather than larger, as such a pit will feed that number for about two months, and it might happen that it will not be necessary to feed longer. If the pit were larger, only a portion may be required, and the pit then remains open. This does not lead to a great amount of loss, but at the same time it is more satisfactory to use the pit right out.

Preferably the pits should be made in pairs, as each can be filled alternately, and opportunities allowed for the settling of the material. A pit about 60 feet by 21 feet by 9 feet deep will hold about 100 tons. The whole of the excavation is done with the plough and scoop. A careful man can make the sides almost perpendicular. We have made pits 9 feet deep with a difference of about only 2 feet between the top and bottom widths. The ends are left with a batter, and the steeper the batter the better.

Filling the Pits.

Cutting with the reaper and binder is the most economical method, as the sheaves are easier to handle than loose stuff. This makes up for the cost of the twine. A team of about six men is required, one to drive the binder, who can help with the waggons when he has cut enough crop for the day's work, four men with two waggons, and one man in the pit. If waggons are not available, slides can be used for bringing in the material. These are very handy, as one man can load a slide and bring in a lot of stuff in a day. In filling the pit the sheaves are laid lengthways. Cutting the twine on the sheaves allows the material to settle evenly. It is preferable to remove the twine, as it may cause trouble amongst the stock when the silage is being fed. The pit is filled up practically to the ground level, and the waggons are then drawn into the pit and over the material when unloading. This helps to compress it. Some men, when making silage, take the waggons or drays in from the commencement and tip the loads, or pull them off with ropes.

When the pit has been filled up to the ground level, or a little above, the material must be allowed to settle for a couple of days. The advantage of working two pits comes in here, as one may be settling whilst the other is being filled. In a couple of days the material will settle considerably. Work should then be resumed and the material built up until it is about 4 feet above the surface, keeping the stack fairly square. A further period of settling should be allowed, and when this has taken place the filling may be continued. Careful note should be taken of how the pit settles, as this gives a good indication as to when it will be safe to stop. When it is considered that the bottom has settled thoroughly it should be again built to a height of about 4 feet. We find that allowing periods for settling, and spreading the work over about a fortnight, the pit is so filled that when covered it will not settle below the land surface level. Even when allowing for plenty of settling, and leaving a stack of about 4 feet, the material will, after a few months, sink down until only a slight mound is left. It is very important to get the pit well filled, otherwise after a few weeks the site of the pit will be marked by a deep depression. Thus, not only is the use of some of the storage capacity of the pit lost, but water will run into it. This is unwise, although rain does not injure the silage, and even very heavy falls during the process of making causes no damage. A well-filled pit, a few weeks after filling, will show just as a small mound. It must be remembered that even when pressed in as tightly as possible the material is, comparatively speaking, very loosely packed. The heat generated softens the stems, and the enormous pressure of the greenstuff above and the covering of earth presses it together until finally it becomes almost as solid as a plug of tobacco.

Covering the Pit.

After the final filling it is advisable to allow the material to settle for two or three days. This reduces the height and renders covering easier. If the rate of settling is very slow, it may be taken for granted that the pit has been well filled. If there is any doubt the work of covering may be left for a week. The delay will not result in any appreciable loss, and will show whether further filling is required.

The work of covering is done with a scoop. At Coonamble Experiment Farm we scooped the earth straight on to the top of the greenstuff. Practically no loss of material occurs. Pits which have been emptied have only shown about 2 inches of loss at the surface. A covering of about 9 inches or a foot of earth is required. It is quite unnecessary to use a deeper layer as it does not protect the silage any better, and means greater expense in covering and in removing the soil later.

It will be noted that nothing has been said in regard to noting the temperature of the material as the pit is being filled. It has not been mentioned because we do not find it necessary. It can be taken as a certainty that if the crop is cut at the stage indicated and put straight into the pit the result will be satisfactory, and there is no more need to take the temperature than there would be when building a haystack.

At the same time a man who is making silage for the first time is naturally anxious to know how things are going in the pit, and for his own satisfaction he may like to be able to take the temperature It can easily be done by placing a gas or water-pipe upright in the centre of the pit to project above the surface, and whenever it is desired to take the temperature the thermometer may be lowered into the pipe.

Cost of Pits.

In all four pits, with an aggregate capacity of about 550 tons, have been made on the Coonamble Experiment Farm. Two were excavated in 1913, and two during the following year.

Accurate records of the time taken and the wages paid were kept. One man was paid 10s. and one 8s. per day of eight hours, four horses were used, each valued at 2s. per day. In estimating the present-day cost of excavating a pit the necessary adjustments in connection with the increase of wages can be made.

In 1913 two pits with a total capacity of about 500 cubic yards, giving holding capacity of 250 tons, were excavated.

The cost was—Wages, £24 6s. 1d.; horses, £10 16s.; a total of £35 2s. 1d. The cost per cubic yard was 1s. 5d., equal to 2s. 10d. per ton of silage.

In 1914 two more pits, totalling 600 cubic yards, were excavated at a cost of—Wages, £19 7s. 2d.; horses, £7 13s. 6d.; a total of £27 0s. 2d. The cost per yard in this case was 10¾d., equal to 1s. 9½d. per ton. The great reduction as compared with the first two pits was due to the previous experience and to the better implements which were available.

The cost of cutting and filling each year was as follows:—

	£	s.	d.
1913—Twine	6	12	1
Wages	45	10	9
Horses	21	0	6
Total	£73	3	4

A total quantity of 250 tons of silage was made, the cost per ton working out at 5s. 10d., which included covering the pit with earth.

	£	s.	d.
1914—Twine	10	17	11
Wages	51	17	9
Horses	26	13	0
Total	£89	8	8

The total quantity of silage put up was 300 tons, costing almost 5s. 11d. per ton.

The pits, if well looked after, will last several years, so that the cost to be debited against each ton of material is practically nothing—it would amount to about 3d. per ton. Even allowing the full cost of the pit against the first filling, the total cost per ton amounts to a little under 8s. per ton. To this must be added the cost of growing the crops.

The 550 tons made at Coonamble were cut from 110 acres of land. We were, of course, fortunate in getting heavy crops, the average yield being 5 tons per acre; but it must be considered that the silage is not required every year, and it will be found in practice that if a good supply is put by in the years when the crops are heavy none need be put up when they are light.

The practice in raising a crop for silage is to plough or disc up stubble land as soon as the wheat is off, and sow early. The only operations are ploughing, harrowing, and drilling. On heavy land ploughing costs about 8s., harrowing 9d., and drilling 1s. 6d. Seed costs about 2s. 6d., giving a total cost of 12s. 9d. per acre. The cost with the average yield thus works out at about 2s. 6d. per ton. The cost of the silage is therefore 5s. 10d. for making, and 2s. 6d. for the crops, amounting to 8s. 4d. per ton.

Feeding the Silage to Sheep.

The pits are uncovered by simply removing the earth with a scoop. If any earth happens to get mixed with the silage, it shakes out when the silage is thrown to the stock. It is preferable to open up a section at a time—say, 16 feet of the length of the pit. The silage will be found to have a coating of, perhaps, 2 or 3 inches of rotten material. This can easily be forked out of the way. The silage is densely packed and almost as solid as wood, and is cut out in benches of about 4 feet the full width of the pit with an axe or an adze. When a clear face is obtained and a block is cut, the silage can be lifted quite easily. From our experience we found that one man could feed 800 to 1,000 sheep daily, giving them a liberal allowance. The silage need only be thrown out over a clean piece of ground, spreading it well. It is better to get a good deal out every day before the sheep are allowed to feed, as they not only surround the waggon and are likely to be injured, but the strong ones run ahead picking the choice bits and trampling the remainder. Sheep should be drafted into lots according to their strength for feeding; if this is not done, the strong ones take all the best of the silage and leave only coarse straw for the weaker ones. This is likely to cause compaction in the stomachs of those sheep which continually get the worst of the feed. If the sheep are all of about the same strength they get the feed equally and no trouble will be experienced.

We do not give any other foodstuff with the silage, and find the sheep do well. It is necessary, however, to give an ample supply of common salt, in which about 6 per cent. of Epsom salts has been mixed.

Loss of Silage in Making and Feeding.

In the pit method practically no waste occurs. After feeding out one pit of about 90 tons, only a few straws could be seen lying about the pit and paddock. The total waste in the pit and whilst feeding did not amount to more than 1 per cent. of the material originally put in.

NITRATE OF SODA.

A NEWLY constituted body styled the Associated Producers of Chilean Nitrate is now officially selling nitrate of soda at a definitely fixed price delivered alongside ship at Chilean ports.

The price fixed is considerably below that which was ruling during the last year of hostilities, but the landed price here will still depend largely on the freight rate in bringing forward cargoes.

It is understood that negotiations are now proceeding which should assure the arrival in Australia of ample stocks of nitrate of soda in the spring, and although the price is still likely to be considerably higher than in pre-war times as the result of increased cost of production in Chile, as well as of higher freights, still it should be purchasable at an appreciable reduction on that now ruling.

Farmers' Experiment Plots.

WHEAT AND OAT EXPERIMENTS, 1918.

North-western District.

R. W. McDIARMID, Inspector of Agriculture.

THE wheat experiments conducted during the past year in the north-west were located as under, and were conducted in conjunction with the farmers mentioned :—

W. Palmer, Eulah Creek, Narrabri.
J. J. Carroll, Bohena Creek, Narrabri.
J. Cherry, Wee Waa.
A. E. Philp, Bellata.
J. T. Maunder, Pallamallawa.
Wm. Lennox, Baan Baa.
Y. C. Ormiston, Gunnedah.
J. Perry, Quirindi.
J. E. O'Grady, Nemingha, Tamworth.
Bignall Bros., Manilla.

The plots in each instance consisted of at least 10 acres, with each individual plot 1 acre in area. They comprised, principally, variety trials, with an occasional manurial trial.

The Season.

The season was the most unfavourable throughout the whole of the north-west for many years past, and in many places it was equal to, if not worse than, the big drought of 1902.

The rainfall was very good for January, but from then until July and August it was almost too light to register, and of no use to farmers, especially to those on the black soil. These conditions, on top of the two wet years that preceded, made early ploughing almost impossible, and consequently the seed-bed could not be properly conditioned in time for seeding, and sowing took place almost simultaneously with the ploughing. In some few instances the land was ploughed dry and sown before the rain, but only with the result that the wheat was choked out by black oats and weeds which could not be previously germinated and destroyed.

Not being able to plough early and establish the necessary consolidated seed-bed also deprived the wheat crops of opportunity to withstand dry conditions, and they naturally failed with the approach of summer, many not being even fit for haymaking. Generally, the only successful plots and crops in the district where those grown on land which had been ploughed early, or else worked very lightly after the rain. This latter method destroyed the germinating weed and oat seeds, left a clean wheat crop, and the solid seed-bed was better suited for making use of the light rainfalls and subsoil moisture than those paddocks worked and sown dry which never —through want of rain and cultivation—compacted to form a seed-bed suitable for a dry year.

The following registrations of rainfall, taken at or very near the plots, shows the nature of the season :—

TABLE showing Rainfall in the North-western District during the Year 1918.

District.	Yearly Average.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
	inches.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts	inches.
Narrabri	26·25	506	0	40	234	0	0	97	529	25	53	102	78	16·64
Wee Waa	....	249	73	8	144	62	8	167	577	32	73	10	71	14·74
Pallamallawa* ..	23·79	280	21	0	125	57	76	110	405	15	106	87	..	..
Gunnedah ..	24·98	443	41	30	24	32	58	120	355	28	37	163	18	13·59
Quirindi	27·62	542	9	4	107	31	33	121	519	52	3	105	10	15·36
Tamworth.. ..	27·32	538	0	5	95	18	11	113	421	64	19	220	36	15·40
Manilla	26·19	478	114	19	42	29	16	152	412	32	50	257	31	16·31

* Moree.

The above table not only shows the rainfall to have been very low for the year, but the distribution to have been even worse. The rainfall for Bellata and Baan Baa was not available in the vicinity of the plots, but it can be regarded as somewhat similar to that registered at Narrabri.

Although the autumn was extremely dry and winter rains much below requirements, the plots (and wheat generally) made rapid growth for a while, and promised good returns until the end of September.

The Various Plots.

Narrabri.—The land here had been cropped to wheat the previous year, disc-ploughed in February, and again in May. The seed was drilled on 30th May, into a dry seed-bed, at 50 lb. of seed per acre. No manure was used on the varieties, but two plots were sown with 30 lb. of superphosphate per acre for comparison. The later varieties here failed, and were fed off, while the earlier maturing ones were cut for hay, yielding from 3 cwt. to 8 cwt. of hay per acre, sufficient indication of the lightness of the growth.

Wee Waa.—Some varieties were sown on new land ploughed in January and disc-cultivated in May ; others were sown on land cropped to wheat the previous year, disc-ploughed in April, and disc-cultivated in May. Varieties sown on the old ground made the best growth, and returned the highest yields. The plots were sown on 12th and 13th June, using 50 lb. of seed per acre. The plots were harvested from 12th to the end of November ; very good yields would have been gathered had a little more rain fallen.

Bellata.—The plots were sown here on land cropped to wheat the previous year. The season was too dry to work it early, and it was not ploughed until May. It was again worked in June and August, and the seed sown on 14th August at 50 lb. per acre. The season proved too dry, and the plots were fed off, the growth being too light even for hay.

Pallamallawa.—The land utilised here for the plots was sown to wheat the previous year, but it failed to germinate, so the land was like an unworked fallow. It was ploughed early in February, and again lightly on 15th May. The seed was drilled on 21st May into a seed-bed that was fairly moist, but not sufficiently so for proper germination and growth. After the July rains the plots all grew rapidly, and until the middle of September the prospects were never better in the district for heavy returns. The want of moisture from then on ruined most of the crops, especially anything sown on non-fallowed land. The earliest varieties naturally yielded the best. The plots were harvested from 1st to 14th November as they ripened.

Baan Baa.—The plots were sown on land cropped with wheat the previous year. Ploughing was not possible until after a storm at the end of April. It was subsequently spring-tooth cultivated in July and again in August. The seed was drilled on 19th August, using 50 lb. per acre without fertiliser. The season proved too dry for such late sowing, and the plots were ultimately fed off, the growth being insufficient to harvest for hay.

Gunnedah.—This district was the worst throughout the north-west for the wheat grower. The land for the plots was cropped the previous year, and was prepared for the plots in March by ploughing and harrowing. Sowing was done on 22nd May, using 45 lb. per acre. The germination was early, but rain did not fall to keep the plants growing, and they were practically dead when the July–August rains eventuated. However, they recovered well and promised good yields in September, but ultimately failed and were not harvested with the exception of the Sunset variety which returned nearly three bags per acre; that was, in fact, the only 2 acres harvested out of 750 acres sown by this grower.

Quirindi.—The plots here were the most successful of the series, yielding up to 21¼ bushels per acre. The rainfall during the growing period was only 6·79 inches, and for the whole year 15·36 inches. The plots were on the heavy soil typical of the district. The same paddock harvested 11 bags per acre the previous year, and the year before that the return would have been higher still had it been possible to gather all the crop. For the 1917 crop, the paddock was spring-tooth cultivated only; for the plots it was impossible to plough early, and was allowed to stand until after rain fell in July and August. It was then spring-tooth cultivated both ways, once in July and then in August. The seed was drilled on 13th August, using 50 lb. per acre and no fertiliser. The 1917 stubble was burned and then sheep occupied the paddock until sowing. The preparation adopted suited the season, for the weeds were all destroyed prior to sowing the wheat, and the wheat was sown in an ideal seed-bed as far as its mechanical condition was concerned. The surface 3 inches was in fine tilth, with firm, compact, moist soil immediately underlying it. This condition of the seed-bed enabled the land to retain the light falls of rain during the growth of the plants, and likewise facilitated the rise of the subsoil moisture. Had a little more rain fallen during the critical period up to 12 bags per acre would have been harvested. The plots were much better than most other crops in the district.

Where late ploughing was adopted the land never properly compacted again and the crops suffered accordingly, for the soil was unable to retain the light falls, and was also unable to assist the rise of the subsoil moisture. The plots were remarkably free from weeds and black oats, and withstood the drought conditions remarkably well.

An interesting comparison can be made with the plots in the season 1915 at the same farm. In 1915 the total rainfall was 18·90 inches, that during the growing period 8·88 inches, and the best yield 5½ bushels per acre. In 1918 the rainfalls respectively were 15·36 inches and 6·79 inches. On each occasion the plots were preceded by a wheat crop, but there was a very big difference in the preparation of the seed-bed. The land was prepared for the 1915 plots by ploughing 5 inches deep in January, spring-tooth cultivating in March, harrowing in June, and drilling at 50 lb. per acre on 6th July. The seed-bed never compacted properly, and the crop rapidly burned off with the approach of summer.

The following table shows the yields from the same four varieties in these two dry years:—

Year.	Federation.		Bunyip.		Bomen.		Currawa.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
1915	1	13	3	25	5	32	1	0
1918	16	30	19	7	14	20	16	17

These figures plainly demonstrate the importance of a firm, compact seed-bed for wheat, especially in the heavy soil of the north-west.

Tamworth.—The land utilised here for the plots had not been cropped for about three years, and had not been worked during that time. It was too hard and dry to plough early, and was only worked up during May and June. The plots were sown dry before the rain on 10th and 11th July, and consequently all weeds and oats had the same start as the wheat. The crop was dirty and growth very light, and was not even harvested for hay.

Manilla.—The land was cropped for wheat the previous year, but the yield was very light. The land was ploughed early in February, and again late in May; harrowed and drilled, using 45 lb. per acre, on 30th July. The rainfall was insufficient for wheat generally in the district, and practically all the wheat failed. The plots were not sufficiently developed to cut for hay when the dry hot weather killed them.

Manurial trials were included at Narrabri, Baan Baa, and Tamworth, but no results were obtained owing to the complete failures at all three centres.

The Variety Trials.

Federation and Hard Federation were sown in all the plots excepting those at Tamworth. In each instance where they were harvested Hard Federation yielded heavier than the old strain. The samples of grain were also better.

The early varieties—Sunset, Canberra, Bunyip, Florence, Clarendon, Steinwedel, and Comeback—produced good samples of grain, and were, generally speaking, the best yielders.

The late varieties—Currawa, Major, Marquis, Marshall's No. 3, Huron, Rymer, Cleveland, Roseworthy, and College Hunter—were too late for the season, and samples were mostly not good. College Hunter failed hopelessly at Quirindi. The growth made was no better than ordinary rye grass, and it burned off without attempting to reproduce itself. The plot at Manilla behaved in a similar manner.

Rust was not troublesome anywhere, and was scarcely noticeable in the best grown plots at Quirindi and Pallamallawa.

TABLE showing Results of Variety Trials, North-western District, 1918.

Variety.	Quirindi.		Pallamallawa.		Wee Waa.		Gunnedah.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Federation	16	30	10	6	5	33	...	
Hard Federation ...	21	15	10	40	6	46	...	
Bomen	14	20	7	25	3	57	...	
Currawa	16	17	8	12	1	47	...	
Major	14	4	5	6	...		...	
Huron	9	2	...		...		...	
Sunset	16	43	13	13	9	0	8	15
College Hunter ...	Failed.		...		...		...	
Canberra	...		12	46	6	47	...	
Rymer	..		6	13	5	35	...	
Cleveland	...		3	34	...		...	
Marquis	...		4	32	...		..	
Marshall's No. 3 ...	...		4	28	...		...	
Florence	...		...		6	17	...	
Warren	..		...		...		...	
Clarendon	...		11	22	7	10	...	
Roseworthy ...	...		...		...		...	
Steinwedel	...		...		8	1	...	
Comeback			9	34	...		...	
Bunyip	19	7	...		7	16	...	

Conclusions.

As regards the varieties grown, no variety can be singled out as the best, for the conditions were so adverse and unusual. However, judging from the results from the Quirindi plots, Hard Federation appears to be the best for years free from rust, and apparently will largely take the place of Federation in the North-west so soon as more seed is available.

Another noticeable feature of this year's investigations is the superior yields from the seed procured from the previous year's plots and distributed throughout the district. This would be expected in a severe year, and farmers are realising the value of selected seed over the ordinary seed that they have never attempted to select or even grade before sowing.

Undoubtedly the most valuable point demonstrated by the dry conditions has been the necessity for a good, firm, and well compacted seed-bed for wheat. It is an essential to the successful growth of wheat, particularly under dry conditions. With a proper seed-bed, wheat is better able to utilise both the rain that falls during growth and the moisture that is stored in the subsoil. This difference in seed-beds was very marked at Pallamallawa this year. The firm consolidated seed-bed resulting from early ploughing and subsequent working returned from four to six bags per acre more than the portion ploughed late, and in insufficient time to produce the desired condition. The land prepared late never consolidated but remained loose and friable, and immediately the hot weather arrived the crop burned off completely. Farmers are again urged to plough early, work the fallow, and insist on all late ploughings and cultivations being as shallow as practicable.

Western District.

J. E. SYME, Assistant Inspector of Agriculture.

WHEAT and oat experiments were conducted during the season 1918 at the farms of the following :—

J. Parslow, "Kelvin Grove," Collie Road, Gilgandra.
D. A. Rich, "Roselayne," Curra Creek, Wellington.
M. F. Dalton, "Duntryleague," Orange.
S. Reilley, junior, Eurimbla Roadside, Molong.
W. R. Werner, "Pinefield," Nymagee.
S. G. McCauley, "Osterley," Ootha.
W. W. Todd, "Brookfield," Trundle.
R. W. Shelton, Nelungaloo.
E. A. Draper, "Harris Park," Alectown West, *via* Parkes.
H. J. Clements, "Curraweana," Cowra Road, Grenfell.
D. Berrell, "Bellvue," Euglo, *via* Condobolin.
E. J. Allen, Gregra.

The plots at Ootha were almost a complete failure, owing to their being sown on unfallowed land.

At Nymagee the crops looked exceedingly well up to the 18th September and gave great promise, but immediately after that date they started to dry off, and, as the dry weather did not break, the yields were light.

On the other hand, at Grenfell, although the rainfall on the growing crop was 14½ inches, the yields were remarkably light, due in great measure to the extremely dirty condition of the ground, black oats being predominant.

Cultural Notes.

Gilgandra.—Soil, grey loam ; mouldboard-ploughed 1st and 4th August, 1917 ; spring-toothed 12th December, 1917 ; one-way disced 1st February, 1918 ; spring-toothed 6th and 7th May, 1918 ; and drilled in on 8th, 9th, and 10th May, 1918. 52 lb. of seed and 28 lb. superphosphate per acre.

Wellington.—Soil, red loam ; dics-ploughed in August, 1917 ; harrowed in September, 1917 ; spring-toothed in November, 1917 ; skim-ploughed and harrowed in January, 1918 ; and cultivated twice previous to sowing with drill on 4th and 6th May. 60 lb. of seed and 60 lb. superphosphate per acre.

Orange.—Soil, red basaltic loam; mouldboard-ploughed December, 1917; disc-cultivated and harrowed 1st April, 1918; rolled, 11th and 18th April, and harrowed, 19th April, 1918; plots drilled in on 29th April. For wheat 60 lb. of seed, and for oats 2 bushels were used, with 56 lb. of superphosphate per acre.

Eurimbla.—Soil, medium red loam; mouldboard-ploughed 7 inches deep in September, 1917; again ploughed April, 1918, and harrowed. Drilled in on 2nd, 3rd, and 4th May, 80 lb. of seed with 42 lb. superphosphate per acre being used.

Nymagee.—Soil, medium red loam; mouldboard-ploughed 4th and 5th August; harrowed in September, 1917; disc-cultivated in April, 1918, and May, 1918, and plots drilled in 28th May, 1918; 45 lb. of seed and 28 lb. superphosphate per acre being used with the wheat, while 50 lb. of oats were sown per acre.

Ootha.—Soil, light red loam; disc-ploughed in March; harrowed 20th May, previous to drilling in on 20th and 21st May, 1918, using 60 lb. of seed and 28 lb. of superphosphate per acre.

Trundle.—Soil, medium red loam; disc-ploughed in June, 1917; disc-cultivated in September, 1917; and harrowed previous to sowing on 13th and 14th May, 1918; 45 lb. of seed with 42 lb. of superphosphate used per acre.

Nelungaloo.—Soil, strong red loam; ploughed with the disc at the end of July and harrowed immediately afterwards; spring-toothed end of October, 1917, and one-way disced end of February, 1918; sown on 30th April, 1918, 60 lb. of seed with 88 lb. superphosphate being used per acre.

Alectown West.—Soil, strong red loam; mouldboard-ploughed beginning of September, and harrowed end of September, 1917; cross-harrowed in October, 1917; one-way disced in January, 1918; spring-toothed early in May, 1918, and drilled in on 14th and 15th May, 1918; 56 lb. of wheat and 60 lb. of oats, with 28 lb. of superphosphate, being sown to the acre.

Grenfell.—Soil, grey sandy loam; ploughed October, 1917, and harrowed; one-way disced latter end of February, 1918; one-way disced again on 6th May, 1918, and drilled in 7th and 8th May, 1918—65 lb. of seed with 28 lb. of superphosphate being used.

Condobolin.—Soil, red loam; disc-ploughed end of February, 1918, and disc-cultivated end of May, 1918; drilled in on 11th and 18th June, 1918, 50 lb. of wheat and 60 lb. of oats being used, with 28 lb. of superphosphate per acre.

Gregra.—Soil, strong red loam; mouldboard-ploughed April, 1917, and then spring-toothed and harrowed; ploughed again August, 1917, and harrowed; spring-toothed in October, 1917; mouldboard-ploughed about 4 inches deep at the beginning of February, 1918, and harrowed; spring-toothed first week in May, 1918; drilled in on 23rd and 24th May, and harrowed. 60 lb. of seed, with 48 lb. of superphosphate, was used per acre.

Rainfall.

The rainfall in the various districts was as follows:—

TABLE I.—Showing Amount of Rainfall on the Growing Crops, Western District, 1918.

	Gilgandra.	Wellington.	Orange.	Eurimbla.	Trundle.	Nelungaloo.	Alectown West.	Grenfell.	Condobolin.	Gregra.
	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
April	...	...	...	...	...	...	..	...	...	...
May	83	108	202	124	113	78	112	347	...	..
June	17	203	343	203	105	199	137	259	72	74
July	102	89	330	100	53	90	102	157	62	86
August ...	248	385	695	375	233	241	196	465	88	352
September ...	15	32	83	60	42	43	37	60	40	37
October ...	43	24	180	107	30	71	69	91	85	60
November ...	...	40	54	63	27	...	36	71	...	41
December ...	...	6	68	...	...	...	...	...	...	...
Total ...	508	887	1,955	1,032	603	722	689	1,450	347	650

It will be seen by a perusal of the above figures that, while there was sufficient rainfall in the winter and early spring to promote good germination and growth in the early stages, the season became drier, until there was not enough precipitation in many cases to warrant exceptionally good yields. As the ground became drier and drier, the effects of the small rainfall in September, October, and November, being scattered over a few days, made hardly any difference, most of it being evaporated in a very short time. As a result, the early varieties had a much better chance in the drier districts than the later ones, although in districts such as Alectown West, Wellington, and Nelungaloo the yields of such varieties as Rymer, Marshall's No. 3, Currawa, Roseworthy, Bomen, and Penny were very creditable, due more to the careful preparation of the fallow than to the amount of rain on the crop.

As the season became drier, and the wheat was in flower, much doubt was expressed by farmers as to whether the grain would fill; but experience of the season shows that if the wheat has been grown on fallow land the grain almost invariably fills well, though very slightly pinched in some cases. The want of moisture makes itself felt in other ways on the fallow, a good many of the shoots dying off; and later, when the heads are formed, instead of each spikelet carrying three or more grains, the centre flowers do not set at all, and each spikelet carries only two grains. This was almost invariably the case, except on the edge of the plots, where there was more moisture, due to the intercultivation, and the spikelets consisted of three grains in all cases except Major, which carried four or five. The effect of the dry weather was also felt in the number of spikelets carried by each head, which, this year, was in nearly all cases eight on each side.

TABLE II.—Showing Rainfall on the Growing Crop compared with the Yields, Western District, 1918.

Locality.	Average Yield. bus.	Average Yield. lb.	Rainfall on Growing Crop, inches.	No of Bushels Produced per inch Rainfall.
Gregra	13	49	6·50	2·1
Condobolin	11	8	3·47	3·2
Grenfell	10	45	14·50	·7
Alectown West	24	0	6·89	3·4
Nelungaloo	23	49	7·22	3·3
Eurimbla	27	26	10·32	2·7
Wellington	25	31	8·87	2·8
Gilgandra	13	0	5·08	2·6
Trundle	13	8	6·03	2·3

The yield of the Grenfell plots was, as stated before, affected by black oats, but the yields of the other plots show that from every inch of rainfall at least 2 bushels were produced, the greatest production being at Alectown West, where 3·4 bushels were produced for every inch of rain. The results at Condobolin are, therefore, very striking, as, although the average yield of all the wheats was only 11 bus. 8 lb., the yield per inch of rainfall was 3·2 bushels.

TABLE III.—Showing Results of Wheat Variety Trials, Western District, 1918.

Variety.	Gregra.	Condobolin.	Grenfell.	Alectown West.	Nelungaloo.	Nymagee.	Eurimbla.	Wellington.	Gilgandra.	Trundle.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Canberra	9 22	15 16	9 4	27 40	31 17	..	34 35	..	14 0	13 48
Clarendon	11 40	..	7 19	..	..	..	24 31	..	13 0	12 35
Warden	14 0	..	..	..	..	..	27 42	28 30	..	..
Major	12 16	..	10 11	23 44	17 24	..	19 22	28 40	11 27	..
Federation	16 0	8 25	..	25 18	29 6	3 45	29 21	30 56	15 1	13 5
Marshall's No. 3	14 53	..	..	..	23 36	4 10	..	..	..	13 55
Rymer	14 52	7 12	17 28	20 36	..	..	30 52	..	..	11 43
Hard Federation	17 31	8 45	10 0	26 50	30 50	5 8	21 23	26 30	11 40	13 22
Florence	..	13 32	..	..	..	6 55	..	..	..	13 39
Improved Steinwedel	..	12 38	..	28 40	23 26	6 18	..	..	..	..
Bunyip	..	12 13	..	..	..	4 49	..	..	..	..
Currawa	..	..	8 20	..	..	..	26 50	..	15 12	..
Selected Rymer (local)	..	..	12 54	..	..	..	..	..	..	..
Yandilla King	..	..	..	24 34	25 10	..	..	..	..	..
Roseworthy	..	..	..	19 11	20 40	..	34 5	..	..	11 21
Bomen	..	..	..	27 0	..	..	21 3	..	..	13 55
Firbank	..	..	..	16 33	..	..	..	..	..	..
Cowra 15	..	..	..	..	16 42	..	..	..	..	..
Cowra 19	..	..	..	..	20 0	..	..	..	..	..
Penny	..	..	..	..	..	..	25 7	23 32	12 8	11 33
King's Early	..	..	..	..	..	..	27 22	..	..	12 5
Comeback	..	..	..	..	..	3 22	..	..	..	..
Warren	..	..	..	..	..	5 19	..	..	..	..
Sunset	..	..	..	..	..	6 38	..	..	..	..
Huron (local seed)	..	..	..	..	..	..	..	19 44	..	..
Red Wings	..	..	..	..	..	..	..	25 40	..	..
Billy Hughes	..	..	..	..	..	..	..	20 37	..	..
Early Gluyas (local)	..	..	..	..	..	..	..	..	..	16 37
Cleveland	..	..	..	..	..	..	..	..	11 30	..
Average yield per acre	13 49	11 8	10 45	24 0	23 49	4 38	27 26	25 31	13 0	13 8

Notes on Varieties.

Most of the peculiarities of the different wheats were not manifest this season, disease was practically absent, with the exception of a little flying smut; and such disadvantages as weakness of straw and shelling were not apparent, as the weather was all that could be desired for harvesting, which went right through without a hitch.

The highest yield on the plots was obtained by *Canberra* at Eurimbla, where it yielded 34 bushels 35 lb. per acre, and it was well towards the top in all of the plots. Although this variety is weak in the straw it is not brittle, and can be recommended for any season, yielding well under both dry and wet conditions.

Federation, which was grown in nine centres, averaged 19 bushels per acre, and had the advantage this season over Hard Federation, which was grown in ten centres, and averaged 18 bushels. Federation and Hard Federation in the drier districts, such as Condobolin and Nymagee, do not yield as well as the earlier wheats, but hold their own in the more favourable ones.

Most of the wheats did well in different districts, showing that no cut-and-dried selection can be made for the west, but that each district must find by experiment the wheat most suited to its conditions.

Firbank at Alectown West gave promise of a great yield, but owing to its earliness was frosted.

Roseworthy made a good impression everywhere it was tried, yielding up to 34 bushels 5 lb. at Eurimbla, being the second highest yielder on the plots. It appears to be fairly strong in the straw.

Warden gave exceptionally good yields of grain, but is also an excellent hay wheat. It is later than Firbank, but will be a great rival in the later districts.

Currawa seems to stand the dry weather very well. At Gilgandra it remained green while other varieties were dying off, and promises to be suitable in both dry and wet seasons, although the brittleness of the straw is a disadvantage.

Clarendon, a new wheat with a strong straw, promises well in the drier districts. It is early, taking about the same time to mature as Hard Federation.

Yandilla King, Marshall's No. 3, Rymer, Bomen, and Penny all yielded well considering the season.

Billy Hughes and *Red Wings*, two selections from Canberra at Wellington, did well. These are earlier than Canberra, and much better stoolers. They come into head about eight days before Canberra, but do not mature much earlier.

Huron, a bearded wheat, did not form a very good head, being too late for the season.

Manurial Experiments.

It was very early noticeable that the growth was proportionate to the amount of manure, but at the close of the season this was not so marked. Although the yields were also proportionate in three of the places, viz., Alectown West, Eurimbla, and Wellington, this was not the case at Condobolin, Grenfell, and Nelungaloo, where the 56 lb. of superphosphate to the acre did not give as high a yield as smaller amounts.

At Wellington up to 80 lb. of superphosphate to the acre was used, and the use of this amount was justified, as there was an increase of 2 bushels 37 lb. over the yield obtained from using 60 lb. superphosphate—a very handsome profit. It might be said, however, that this land has been cropped for over thirty years, and during the time the plots have been established a two years' rotation with green winter fodder has been used. Although last year the fodders were planted too late to be of the greatest benefit, yet they have been of great value in building up the soil again in organic matter, as the yields obtained will show.

TABLE IV.—Showing Results of Manurial Experiments, Western District, 1918.

Locality.	Variety.	No Manure.	Superphosphate per acre.				
			28 lb.	42 lb.	56 lb.	60 lb.	80 lb.
		bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Condobolin	Canberra	11 8	15 16	11 42	14 41	....	....
Grenfell	Canberra	7 41	9 4	14 26	9 54	....	....
Alectown West ..	Hard Federation	17 0	25 41	26 50	29 42	....	....
Nelungaloo	Hard Federation	20 31	30 50	31 8	28 53	....	....
Eurimbla	Federation	20 32	28 24	29 21	31 18	....	....
Wellington	Federation	27 41	....	30 24	....	30 56	33 33

Rate of Seeding Experiments.

Locality.	Seed per Acre.					
	45 lb.	49 lb.	50 lb.	55 lb.	57 lb.	66 lb.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Gregra	......	10 47	.....	......	9 22	15 25
Nymagee	6 18	......	5 16	4 39	......	......

At Gregra the heaviest seeding gave the best results, but the wheat did not stool well, the stools being burnt off in the spring; while at Nymagee, where there was good rain in the winter and plenty of moisture up to the 18th September when the crops were starting to head, the light sowing gave the best results.

Fallow *versus* Non-fallow.

This test was conducted at Gilgandra, and included an unmanured fallowed plot. The fallowed plots gave an increase of 1 bushel 3 lb. over the unfallowed plot, an increase over the unmanured fallow of 1 bushel 49 lb., showing that even if land is fallowed and worked it does not compensate for the use of superphosphate, but that manure has to be used on the fallow to get the best results.

Variety—Canberra.

Unfallowed, 28 lb. superphosphate per acre—12 bushels 57 lb.

Fallowed, 28 lb. superphosphate per acre—14 bushels.

Unmanured fallow—12 bushels 11 lb.

Oat Variety Trials.

Oat variety trials were conducted at ten centres, the results being summarised as follows:—

TABLE V.—Showing Results of Oat Variety Trials, Western District, 1918.

Locality.	Algerian.		Sunrise.		Guyra.		Lachlan.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Gregra	25	3	26	38	33	14	29	7
Condobolin	......		10	5	15	3	13	20
Grenfell	14	0	12	38	9	34	9	6
Alectown West	......		44	6	41	24	35	17
Nelungaloo	23	1	24	37	21	8	27	16
Nymagee	Failed.		8	32	8	35	7	8
Eurimbla	65	20	......		54	32	58	7
Wellington	41	5	......		42	7	......	
Gilgandra	18	31	15	19	18	29	......	
Trundle	20	6	9	12	18	26	17	16

While the oat trials were satisfactory in three centres, viz., Alectown West, Eurimbla, and Wellington, in the other cases the season was too hot and dry. The yields at Eurimbla were very satisfactory, and this district ought to produce phenomenal yields in a good season; but while the yields were fair in other districts for the season, the oats did not fill well.

Algerian oats yielded the best in the more favoured districts, while Guyra had the best of Sunrise and Lachlan in the others. This is rather astonishing in a dry season like that experienced, as Guyra is later than either of the other varieties.

At Nymagee Algerian oats did not mature at all, being too late for the district and for the season experienced.

Wheat and Oat Variety Trials for Hay.

These trials were conducted at Orange on the property of Mr. M. F. Dalton, "Duntryleague," Orange, being drilled in on the 29th April with 56 lb. of superphosphate per acre, 2 bushels of oats and 1 bushel of wheat per acre being used.

TABLE VI.—Showing Results of Hay Trial, Western District, 1918.

Varieties.	Yield per acre.			
	t.	c.	q.	lb.
Oats—				
Lachlan	2	4	3	8
Guyra	2	14	1	16
Algerian	2	16	3	13
Wheat—				
Warden	3	1	2	10
Marquis	2	10	1	1
Marshall's No. 3	2	18	1	3
Roseworthy	2	9	0	9
Bomen	2	10	3	21
Cleveland	2	3	1	12

Among the wheats Warden holds pride of place with a very good yield of over 3 tons. It is a wheat that is pre-eminently suitable for hay in our later districts, making a nice bright sample of chaff. Of the other wheats, Marshall's No. 3 came next with 2 tons 18 cwt. All the other wheats did well, beating Cleveland, which is a standard for these districts.

Of the oats the best was Algerian, but all the varieties tried gave an excellent sample of hay.

The growth in the early season was very poor, especially in the case of Cleveland and Roseworthy, which made very thin growth, but as the season became warmer these wheats stooled out well and finally shot up, making an excellent stand.

Manurial Tests for Hay.

These tests were conducted with Cleveland, and the growth of the different quantities of manure was very soon apparent, the plot with no manure being very backward.

TABLE VII.—Showing Results of Wheaten Hay Manurial Trial, Western District, 1918.

Manure.	Yields.			
	t.	c.	q.	lb.
56 lb. superphosphate ...	2	3	1	12
42 lb. ,, ...	2	7	3	19
28 lb. ,, ...	2	7	1	22
No manure	1	15	2	27

It will thus be seen that the heaviest dressing did not give the biggest return, the 42 lb. dressing being the best, followed very closely by the 28 lb.

Barley Tests.

Barley was tested at Gilgandra, but owing to the extremely dry season the yields were not large, although a very good sample was produced. The crops germinated well and grew very evenly, forming a good head. The varieties used were Cape Barley and Kinver, sown on the 10th May, using 50 lb. of seed to the acre, and 28 lb. of superphosphate. The yields were :—

Variety.	Yield.
Kinver	16 bushels 10 lb.
Cape Barley...	14 bushels 10 lb.

Central Western District.

B. C. MEEK, Assistant Inspector of Agriculture.

EXPERIMENTS were conducted on the farms of Mr. F. S. Stacy, Gulgong, and Mr. S. H. Robinson, Tallewang.

At *Gulgong* the soil is a red loam, which was ploughed up in September, 1917, after green fodder trials of barley and oats. The ground was disced and harrowed at intervals until the crop was drilled in on 6th and 7th May. No further cultivation was done, and the crop was harvested on 11th December, 1918.

At *Tallewang* the soil is a red loam of a slightly more sandy nature. This plot carried fodder trials previously, and was ploughed up in September, 1917. Cultivation with disc-plough and harrows was given till it was drilled on 8th and 9th May, 1918. The crop was harrowed when 6 inches high. Harvesting was done from the 20th November, when the oats were ripe, till 4th December, when the later wheat plots were ready.

The rainfall was as follows :—

	Gulgong.	Tallewang.
1918.	Points.	Points.
May	77	60
June	47	70
July	156	144
August	289	228
September	42	60
October	175*	77
November	11	22
	797	661
On Fallow	1,655	1,[illegible]97

* Storm, which fell within an hour.

TABLE I.—Showing Results of Wheat Variety Trial, Central Western District, 1918.

Variety.	Gulgong.	Tallewang.
	bus. lb.	bus. lb.
Yandilla King	5 27	18 16
Rymer	...	17 35
Canberra	4 47	15 48
Federation	3 36	14 31
King's Early	...	14 28
Clarendon	...	13 10
Major	5 52	11 32
Warden	6 24	...
Cleveland	4 56	...
Bomen	4 40	...
Currawa	3 2	...

Canberra and Clarendon were the earliest maturers, with Hard Federation next in order, while Yandilla King and Major were the latest in this respect. Yandilla King and Rymer attained the greatest length of straw.

Currawa and Federation at Gulgong, and Yandilla King and Major at Tallewang, showed the worst effects from frost.

No rains of value after August, and late severe frosts in early November, when the ground was in a very dry condition, contributed to the lightness of the yields.

TABLE II.—Showing Results of Manurial Tests with Hard Federation, Central Western District, 1918.

	Gulgong.		Tallewang.	
	bus.	lb.	bus.	lb.
No manure	4	33	12	48
20 lb. superphosphate ...	4	26	11	17
40 lb. ,, ...	5	18	14	20
60 lb. ,,	4	40	11	3

Manurial Oat Variety Trials at Tallewang.

Lachlan yielded 23 bushels 7 lb., while Sunrise gave 18 bushels 37 lb. Sunrise ripened about the same time as Lachlan, and in the early stages had stooled well, five and six stalks being counted repeatedly, with an average of three. Later some of the stalks died off and made the crop thinner, but retaining the finer straw.

CHALCID WASPS IN LUCERNE SEED.

THE Government Entomologist, Mr. W. W. Froggatt, last spring investigated the ravages of the lucerne seed chalcid wasp in the Pallamallawa district. In his report on the subject he stated that the wasp was originally a native of the United States and was introduced into New South Wales with imported lucerne seed. It has for some years past greatly reduced the yield of lucerne seed in the Tamworth district. It was first noticed at Pallamallawa about three years ago; and for the last two years has increased very rapidly, doing a great deal of damage. The tiny black wasp punctures the immature seed and deposits her eggs beneath the skin, under the protection of which the baby larval wasp feeds, grows, and finally pupates. The perfect wasp emerges from the pupa by cutting a hole through the skin of the lucerne seed.

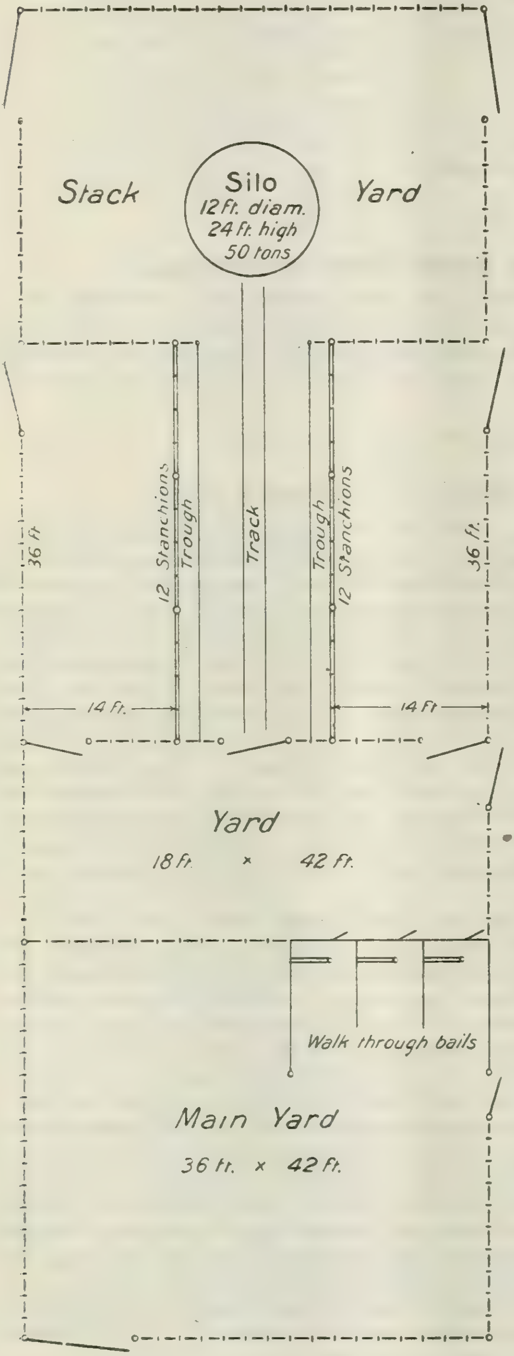
At the time of his visit no wasps could be found about the lucerne flowers, but any waste seed in the thresher or sheds contained a percentage of parasitised seeds in the pupal form, from which the perfect parasites were at any time ready to emerge.

Experiments carried out by the lucerne growers have shown that if the first summer cut is burnt, the next cut can be allowed to ripen for seed. Mr. Froggatt is of opinion that if the first cut is made before the seed is more than half grown, and allowed to dry for lucerne hay, it will not be necessary to burn it, as the immature wasp larvæ will die as the seed withers in the haymaking.

It should be noted that it is purely a case of local infestation of the seed, and the value of the crop for hay is not affected in any way.

A misapprehension which has arisen and needs correction is that the chalcid wasp attacking lucerne is identical with that which is being distributed by the Department to sheepowners in the campaign against sheep-maggot flies. Except that both wasps belong to the family of Chalcididæ, of the order *Hymenoptera*, they are quite distinct species. They are further distinct from the fact that while the plant-eating lucerne chalcid wasp never touches animal matter, the sheep-maggot chalcid wasp never touches vegetable matter, the latter confining her attention to the pupæ of blow-flies.

It is clear, therefore, that there is not the least danger of lucerne being diseased because the lucerne chalcid may be present, or of the sheep-fly chalcid wasp ever becoming a pest of any field crop.



FEEDING-YARD FOR DAIRY COWS.

THE accompanying sketch-plan has been supplied by Mr. Charles F. Garnsey, of Lugar Brae, Aberdeen. He has found it most profitable to hand-feed his cows all the year round, and the only way to get the full benefit of the system is to arrange that each cow is enabled to feed without the others robbing her, and so that the boss cow (which is not always the best cow) does not get the most.

The plan has been drawn for twenty-four cows, but there is no reason why it cannot be enlarged up to 100 cows.

The great benefit is, that no matter how fast the cows are milked they can be allowed to feed quietly and are perfectly safe.

Grass Hay.

R. N. MAKIN, Inspector of Agriculture.

It is a fact that excellent hay may be made from native and other grasses growing in this State. It is also a fact that large quantities of this valuable fodder are allowed to go to waste through not being conserved.

A little energy on the part of those who hold land would secure fodder for their stock which would, if stored for time of stress, alleviate much want and be of considerable importance financially to the owners.

Stacks of Grass Hay at Moss Vale

The cost of harvesting and stacking, where opportunity offers, is scarcely worth mentioning. Where a mower and hay rake are procurable large areas may be dealt with, and, as the stuff usually cures quickly, harvesting is not difficult. It is to be regretted that more attention is not paid to the mowing of the pastures when the growth is luxuriant, as was the case during 1917 and in the early part of 1918, to say nothing of many former occasions.

At Moss Vale, it has been noted with interest, several farmers in the district wisely make a practice of storing their surplus grass, and thus secure for their stock a cheap and nutritious fodder. The illustration of stacks is of grass hay on Mr. O. Phillips' property at Moss Vale. Mr. Bale, manager for Mr. Phillips, states that he secures a stack of this hay every season from an area of about 12 acres by running the mower between and around the trees. The hayrake collects the grass into windrows, and when it is sufficiently dry it is carted to a convenient position, where it is stacked Mr. Bale scatters coarse salt through the stack while building, a hundredweight or so being used altogether on the stack. It is thought that it makes the hay more palatable, and the palatability is undoubted, for the stock on this property are exceedingly fond of the hay fed out to them in the rough, or as chaff, and, judging by their condition, there is no room for complaint as to the feeding value. Two stacks are shown in the illustration. That in the rear was made in 1916, the other in 1917. The growth of the grass will be noted in the foreground. It comprises chiefly kangaroo and love grasses. In good seasons two cuts may be obtained in the twelve months.

On the coast, where rank growths of grass often occur after good rain, much grass hay might be conserved, particularly where there are paddocks of paspalum. Perhaps no better grass hay could be made, provided it is properly cured and stacked. Indeed, farmers in some parts already realise the value of this grass for hay.

It might be mentioned that there are many farmers on the South Coast who consider paspalum a curse, and deplore the growth of it on their property. The writer has met such, but cannot hold exactly the same view. It is not suggested that paspalum should be allowed to spread at random, but if kept in check by proper attention to the paddocks the results might be different. The greatest trouble appears to be in preventing seeding. This may be overcome by mowing the crop for hay when it runs up to head, or, in the event of a wet spell at that time, turning it into silage. It is absolutely the best summer grass and drought-resister we have growing, and when rain falls after a dry spell the rapidity of its growth is remarkable. It is not claimed that paspalum alone makes an ideal pasture. Anyone sowing paspalum pasture is strongly advised to sow White Dutch or Perennial Broad Red Clover with it. It will be noted if a paspalum pasture is examined, how strongly clover—where present—grows with it.

There are other grasses, native and introduced, which might well be mown for hay in our coastal districts. The greatest weight would perhaps be obtained from paspalum; but certainly there is no need for the flagrant waste of feed that takes place in good seasons, especially in a country where it is never known how soon we may have to face a serious shortage of fodder owing to drought.

Notes on Infestation of the Skin, &c., of Sheep by Grass Seeds.

SYDNEY DODD, D.V.Sc., F.R.C.V.S.,
Veterinary Pathological Laboratory, The University of Sydney.

THE condition in sheep due to the penetration of the skin, &c., by certain grass seeds, in parts of the State, and following good seasons, is a very common one and of some economic importance. It is very familiar to sheepowners, and practically every season in which the trouble is more evident than usual, brief references to it appear in the pastoral press. It is not peculiar to Australia. The pathogenic action of this type of grass has occasionally been briefly noted in other countries, the latest being by Veterinary Major Velu on "The Pathogenic rôle of a Moroccan grass (*Stipa tortilis*)" in the *Recuil de Medicine Veterinaire* for January and February, 1917.

It is thought that the following notes collected from various sources, and supplemented by the writer's personal knowledge of the subject, may be of interest to readers.*

Prevalence of Grass-seed Infestation.

In a number of districts in New South Wales little or no sheep breeding is carried on, consequently these areas are not taken into consideration. In the remaining part of the State, and by far the larger, sheep raising is a more or less important industry. The following information is collected from fifty-one districts, which are under the charge of the Pastures Protection Boards. These districts vary considerably in extent, and the incidence of the trouble varies very greatly in different districts, and often in the same district. In some it is never met with; whilst in others it is stated to be more or less prevalent every year. In all cases however, where it does occur, the intensity of the infestation and the consequent injury inflicted on the sheep varies with the seasons. In good seasons grass is plentiful and it seeds freely. In dry seasons the opposite is the case. The season of the year in which the trouble is generally most evident is in the late spring or summer, *i.e.*, the period when the grass seeds are ripening and before they have been shed.

Finally, even in the districts where it is recorded, the trouble does not manifest itself over the entire area, but is usually seen in only parts of it. Various factors will account for this, the first and chief, of course, being the presence or absence of the particular grasses responsible for the infestation; secondly, whether the country is lightly or heavily stocked, the former permitting much of the grass to ripen and seed, the latter helping to prevent it; thirdly, the burning-off of the grass at the proper time where and when practicable; finally, the management of the property, whether the manager or owner intelligently anticipates what may occur, or merely allows things to take their own course.

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*In this connection I desire to express my thanks to Mr. S. T. D. Symons, M.R.C.V.S., Chief Inspector of Stock; Mr. J. W. Mathews, Wool and Sheep Expert; Mr. J. H. Maiden, I.S.O., F.R.S., F.L.S., Director of the Botanic Gardens; the Stock Inspectors in the various sheep-breeding districts, too numerous to mention individually; and other correspondents who have kindly supplied information bearing on their particular aspects of the matter.

Grasses Responsible for the Condition.

Quite a number of grasses are held responsible in the fifty-one districts mentioned, some being common to a number of districts, others only seen in a few areas. The local names are Corkscrew, Spear, Barley, Silver, No. 9, No. 10, Blue, Foxtail, Wire, and Forked grass, also a few others which only occasionally cause trouble. Mr. J. H. Maiden, Government Botanist, to whom the matter was referred, says that it is impossible, in the absence of specimens themselves, to give the botanical species corresponding to the common name or names. The so-called Corkscrew or Spear grasses all belong to the genus *Stipa*, the so-called Wire grasses belong generally to the genus *Aristida*, Barley grass is generally *Hordeum murinum*, and Silver grass *Festuca bromoides*, and the name Blue grass is generally applied to the genus *Andropogon*. He further says that the seeds of the species of the genera *Stipa*, *Aristida*, and *Hordeum*, also *Festuca bromoides*, and possibly those of the genus *Andropogon*, are likely to infest sheep.

The trouble does not occur when the particular grasses concerned are not bearing seed.

Age and Class of Sheep mainly affected.

Sheep of any age may suffer from this trouble, but lambs and weaners are more particularly affected. Reports state that the Merino is affected more than other breeds, but possibly this in some measure is due to the fact that in many districts the Merino is the only breed carried. Of the Merino, wrinkled sheep become much more infested, and suffer more than plain bodied sheep. Crossbreds and English breeds which have clean faces and open wool do not suffer so greatly. It appears to be the general opinion that the Merino wool, on account of its nature, retains the grass seeds more readily than do other types of wool.

Reasons advanced why Sheep of certain Ages are more prone to Infestation, and to suffer more than others.

Young sheep do not avoid the long grass, where seeds are abundant, as do older animals, the latter having learned what to avoid by painful experience. Furthermore, the bodies of young sheep are nearer the ground and their skin more tender and more readily punctured by the sharp-pointed seeds than that of adults. Some sheep, especially some Merinos, have more wool about the eyes than others, and consequently cannot see so readily what to avoid. Merino rams, on account of their horns and wrinkles in the skin, are more liable to collect seeds around the head and neck. Lambs at the period of grass seeding are usually carrying more wool on their bodies than adult sheep, and therefore afford a greater and better catchment surface for the seeds.

So far as the effects are concerned, the constitution of adult sheep is usually more robust than that of young animals, and therefore the pain due to the irritation of the penetrated grass seeds is more readily borne by the former.

Symptoms of Gross Infestation by Grass Seeds.

For convenience the term "infestation" is intended to include not merely the presence of grass seeds in the wool, but the actual penetration through the skin. Until the skin, eyes, &c., are affected, the presence of grass seeds in the wool merely causes the animal inconvenience.

Sheep heavily infested with seeds stand apart from their fellows. They are disinclined to move about; and when they do so, it is with a peculiar stiff gait; at times as if the skin had lost its flexibility, at others as if the animals were walking on hot stones. The stiff carriage of the body is due in the first instance to the thick mass of grass seeds embedded in the wool, and secondly to the pain produced by the sharp seeds piercing the skin. The tender gait is due to the seeds piercing the skin between the claws of the hoof and around the coronet.

Ophthalmia, often followed by blindness, particularly in animals with very woolly faces, is common. It is caused by the seeds getting into the eyes whilst grazing. In badly-infested animals the masses of seeds in the wool give the sheep a brown appearance. The skin becomes hard and loses its pliability. The fleece feels rough on being handled. On account of the considerable pain set up by the seeds piercing the skin, the affected animals show more or less irritation of the body, biting and scratching at the places, and rubbing against trees, &c. This produces a rough appearance of the wool, and may mislead an inexperienced observer in thinking that the animal is infested with vermin. On account of the pain produced by the innumerable seeds piercing the skin, &c., there is more or less considerable loss of condition, with fever. The animal refuses to seek for feed; it suffers pain on being handled or moved, although this may pass unnoticed even by the observant. Some consider that the loss of condition is due not merely to pain, but to want of sleep. Drovers realising the consequences of infestation endeavour to keep their sheep off badly-seeded country, as neglect may result in it being impossible to travel many of them.

Lesions Produced.

The skin lesions individually are not very considerable. The grass seeds, armed with their extremely sharp points, pierce the skin, and aided by the movements of the animal's body, gradually work their way through, and in the majority of cases come to rest in the subcutaneous areolar tissue. In bad cases one may find, on skinning the animal, the under-surface of the skin literally peppered with countless grass seeds, brownish-black in colour, about $\frac{3}{8}$ to $\frac{1}{2}$ inch long, mostly lying parallel to the surface of the skin, although cases have been noted where the skin appeared to have been pinned to the flesh by the seeds.

At times, numerous small subcutaneous abscesses may be found, each containing a grass seed, or small superficial ulcers on the surface of the skin occur. It is, however, rather remarkable to observe that in the majority of cases no suppuration at all is produced, the seeds lying buried in the loose tissues without any pronounced reaction. In some instances the pus of the abscess is of a greenish character, and appears to be due to the Priesz-Nocard bacillus.

As already noted, the majority of the seeds come to rest in the subcutaneous tissues, but some proceed further, and are found in muscles, mainly the superficial set. Sometimes they penetrate into the deep layers. Not rarely also they may even pierce the chest and abdomen and come to rest in the lining membrane. Here they may give rise to a fatal pleurisy or peritonitis. Seeds have also occasionally been detected in the internal organs, viz., liver, kidney, lungs, &c. When they do reach such localities, they become encysted, if bacteria-free, but if bacteria are carried in with them, the consequence is often fatal.

The lesions of the eyes are either an inflammation of the conjunctiva or the cornea, usually of a purulent character. If nothing is done to relieve the condition, ulceration of the cornea often results, and then loss of sight of the affected eye.

Lesions about the hoofs are very common. The seeds pierce the thin skin between the claws and also around the coronet. The result is often more grave than that produced in the trunk, because secondary bacterial invasion is much more likely to take place, independently of the great pain caused by the mere presence of the seeds in the foot. If not attended to, the suppuration may extend and involve the joint.

Mortality.

This naturally varies very considerably in different districts and in different seasons, just as the incidence and the degree of infestation does. At some places, even where grass seed is prevalent the loss, owing to the precautions taken, is practically nil.

The death rate is higher in lambs and weaners than in adult sheep, for the same reasons given when discussing the age of animals affected. Opinion is unanimous that when care is taken the deaths resulting from grass seed infestation are low, but if preventive and other measures are neglected, then the mortality is heavy. An instance is known of a station in 1917 where the mortality among neglected weaners was 75 per cent. Actual statistics of the death rate are unobtainable; but taking the estimates from fifty-one sheep-breeding districts, it may be accepted that in seasons when grass seed infestation is light, the mortality from this cause is negligible, but in seasons when grass is abundant and seeding heavily, the mortality varies from $\frac{1}{4}$ to 50 per cent. in lambs, and from $\frac{1}{8}$ to 10 per cent. in adult sheep. The lightest losses occur where seeds are not abundant, or precautions to prevent infestation are taken in time, and the heaviest losses where the reverse is the case.

Economic Loss.

There is not the shadow of doubt that the economic loss to the owner as a result of grass seed infestation is in other directions much greater than the actual loss by death. The skin is depreciated in value on account of the presence of so many seeds. Loss of condition also affects the value of the animal, dead or alive. The subsequent health and growth of the young animal after bad seed infestation is often affected to a marked degree. The growth of the lamb is checked, and when mature it does not obtain the size and development of an unaffected sheep. It is said, however, that some lambs, after the shearing subsequent to the grass seed season, quite make up for any check that has been occasioned to their well-being, and no permanent injury is noted.

Measures taken to cope with Grass-seed Infestation.

It has to be borne in mind that these measures are in many instances only necessary when seeds are abundant, and in many cases trouble can to a great extent be avoided by taking precautions before the infestation has occurred. The steps taken by various sheepowners are, by the nature of things, nearly entirely preventive. They consist of different plans to prevent the sheep coming in contact with the ripe grass before the seeds are shed, or, in some cases, trying to prevent the seeds reaching the skin. Once the seeds have fallen, no more trouble is apprehended save, perhaps, from the hoofs. On some stations nothing whatever is done to minimise the trouble.

The principal measures are as follows:—

1. Keeping the young sheep in certain paddocks in which the grass has been prevented from seeding by means of heavy stocking.
2. Burning off the grass where practicable as it is ripening.
3. Running cattle and horses in the badly-seeded paddocks in order not only to graze it down, but to knock the seed-bearing grass about during their movements over the paddocks, and so causing the seeds to fall sooner than usual.
4. Shearing the lambs early, and keeping the sheep away from the heavily-seeded paddocks until the seeds have fallen.
5. Fencing off into small paddocks so that the stock may be readily controlled and compelled to eat the particular grass before it ripens.
6. Clipping the wool from around the eyes to prevent to a considerable extent the seeds reaching them, and causing ophthalmia and blindness.

Where mixed farming is carried on, cultivation paddocks or fallow land is usually available to run the sheep on until the seeds have been shed. On large stations where on account of the prolific season none of the above precautions are practicable, some owners have mown wide tracks to the dams and tanks and around the sheep's camping places.

In small paddocks the fall of the seed may be hastened by dragging brush harrows over the grass a few times.

Many advocate the early shearing of the sheep in order to offer less surface for the seeds to catch hold of.

When animals have become infested it is the practice of many owners to swim their sheep through a creek, dip, or other place. It is said that this procedure causes the seeds to swell up and soften in the wool, and so prevents further penetration. On the other hand, some state that this measure has met with but little success. Various other measures are adopted in different localities, but they are mainly variations of those already enumerated.

Vineyard Notes for April.

Vintage operations will be completed, and the ordinary routine work of a vineyard is now being taken up once more. After picking is over it would be wise to break up the more or less consolidated surface soil with the cultivator. In many places preparations for early ploughing will be in progress, and towards the end of the month it may be possible to make a start. In this part of the annual cultivation there is a good deal of diversity of opinion as to the course to be adopted. It is a matter which is largely determined by the volume of the local rainfall, the period at which it falls and locally-established custom. Primarily, the aim and object of the winter cultivation is to facilitate the absorption of water by the soil. It follows, therefore, that the shallower the depth to which the soil is broken, the more quickly does the surface become surcharged with water. Similarly, the finer the condition of the tilth, the quicker does it consolidate to cause loss of water by "washing." It follows that the deeper and more open the surface is left after ploughing, the greater the proportion of water impounded at any one fall of rain. At the same time a deep ploughing early in the season prepares the way for maintaining a deeper moisture-retaining layer in the succeeding spring and summer. In this respect the double ploughing has much to recommend it, the first being given in autumn and early winter, throwing the soil to the centres of the rows and away from the stems of the vines on both sides. The remaining strip which cannot be taken out by the plough is removed with the hand hoe, or by means of a horse-worked "vine hoe." The second ploughing in late winter and early spring throws the soil back on to the stems of the vines, leaving an evenly broken and loose layer to be maintained by summer working.

In some localities a different system is followed, throwing the soil away from and on to alternate rows each succeeding year. If, however, two ploughings are carried out, the first-mentioned plan is the better and costs no more. The vine hoe is an implement little known in this State, but is the means of a very great saving of labour in the removal of strips along the rows of vines. It reduces the cost of hand labour to a minimum, requiring but a steady horse and a little care on the part of the man working the implement.

In many places Downy Mildew has made a late appearance, consequent upon the rains at the latter end of February. In the course of a week succeeding the fall, this disease began to show upon the young growth, but it was too late to have any effect upon either the foliage or the fruit. The recurrence of the trouble serves to illustrate the danger which may arise in any season where showers are frequent.

In the Departmental nurseries there is an ample supply of well-grown grafted resistant vines for distribution. Those who contemplate planting this season should place their orders as early as possible.—H. E. Laffer, Viticultural Expert.

The Native Lime-tree Borer

(*Citriphaga mixta* Lea).

W. W. FROGGATT, F.L.S., Government Entomologist.

Among the many interesting trees peculiar to our western scrubs—a flora where the struggle for existence is so keen—is that sturdy shrub known to the bushmen as the "Native Lime," and to the botanist as *Atlantia glauca*. It is interesting to the economic botanist from the fact that it is one of the very few indigenous plants related to the citrus family; and from the United States, where the field investigators of their Department of Agriculture are always on the lookout for useful plants, the writer has had several requests for seeds. The seeds were wanted for cultivation to see if the stock of our wild lime would be suitable as stock on which to graft the more delicate cultivated oranges and lemons. These shrubs generally grow in small clumps of about a dozen, and range from 1 to 8 feet in height, their dark green tint showing up on the edge of the scrub intersecting the level plains of north-western New South Wales.

In the early stages of their growth the wild limes are almost leafless; the erect shrubby stems and branchlets covered with long slender needle-like spines render them very awkward plants to handle, and protect them in a wonderful way from plant-eating animals. The old trees, growing up on a single stem as all the surrounding branchlets die back, often reach a height of 15 feet; the spines are then so reduced in size as to be hardly noticeable, and are replaced by a luxuriant growth of small dark green leaves.

Early in December the twigs are covered with small rounded soft green-skinned fruits, enclosing a grape-stone-like seed, embedded in the fruit pulp, but a large number of them are seedless. When full grown these fruits turn to a golden yellow. These fruits have a distinctly acid lime flavour, and crushed in water, to which sugar has been added, make a refreshing drink.

The wild lime grows plentifully in the Moree district; and while collecting insects the writer discovered that a large number of the half-grown trees were badly damaged by borers. During the last summer a number of infested branches were cut out containing the active larvæ, which were kept under observation while the life history of the beetle was investigated, and from them a fine series of the perfect beetles was bred out in the Insectarium.

The eggs are deposited in the bark a few inches above the ground; the feeding stage of the active larva can be estimated as about ten months, and the pupal state as lasting from a month to six weeks. The larva works up the centre of the stem, forming a large open bore often straight ahead for 4 or 5 feet; but where, as is sometimes the case, there are several larvæ at work, they form parallel burrows and riddle the whole stem. The action of the larvæ causes a considerable gumming of the damaged wood; often large clear lumps of gum are found on the side of the stem, and even running in a liquid state down the excavated bore in the centre of the branch.

In 1892, when a number of orange orchards were planted out in the Tweed River district, a borer appeared in the trees, and a number were seriously damaged. The trouble was carefully investigated by the late Mr. A. Sidney Olliff, who bred a large longicorn from the infested stems; this was described and figured in this *Gazette* (vol. III, 1902) under the name of *Uracanthus cryptophaga.* Further investigation proved that this beetle had emigrated from the native finger lemon (*Citrus australasica*), its natural food plant, growing in the brush near the orange trees. It is therefore not at all unlikely that the species figured in this article may develop a similar propensity, and appear some day in the citrus trees in the squatters' gardens in the north-west.

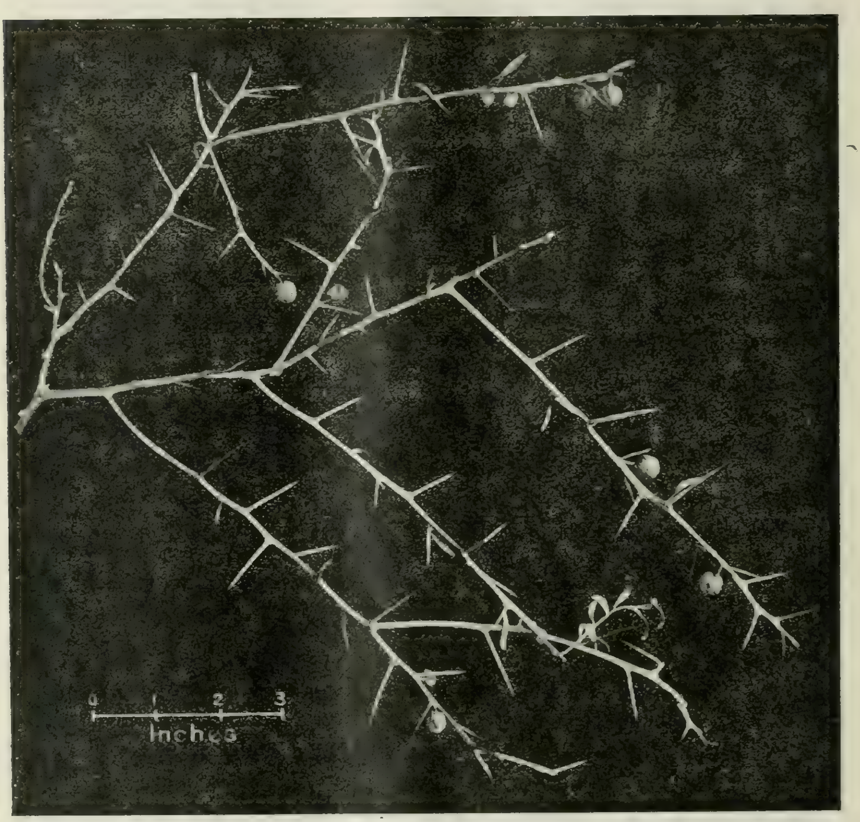

Fig. 1.—Branch of Native Lime, showing first stage of growth before the leaves appear

General Description.

The larva measures up to 1¼ inches in length and is of the usual elongated form of a longicorn beetle. It is of a uniform dull yellow tint, with head dark chocolate brown; the prothoracic segment large, dull white, blotched on the lower margin and sides with dull red, flattened and lobed behind; the second and third thoracic segments are very narrow and constricted; and each of the three segments is furnished with a pair of small but well developed legs, terminating in a fine point. The first seven abdominal segments are of a uniform size, with deep corrugations between; both do s

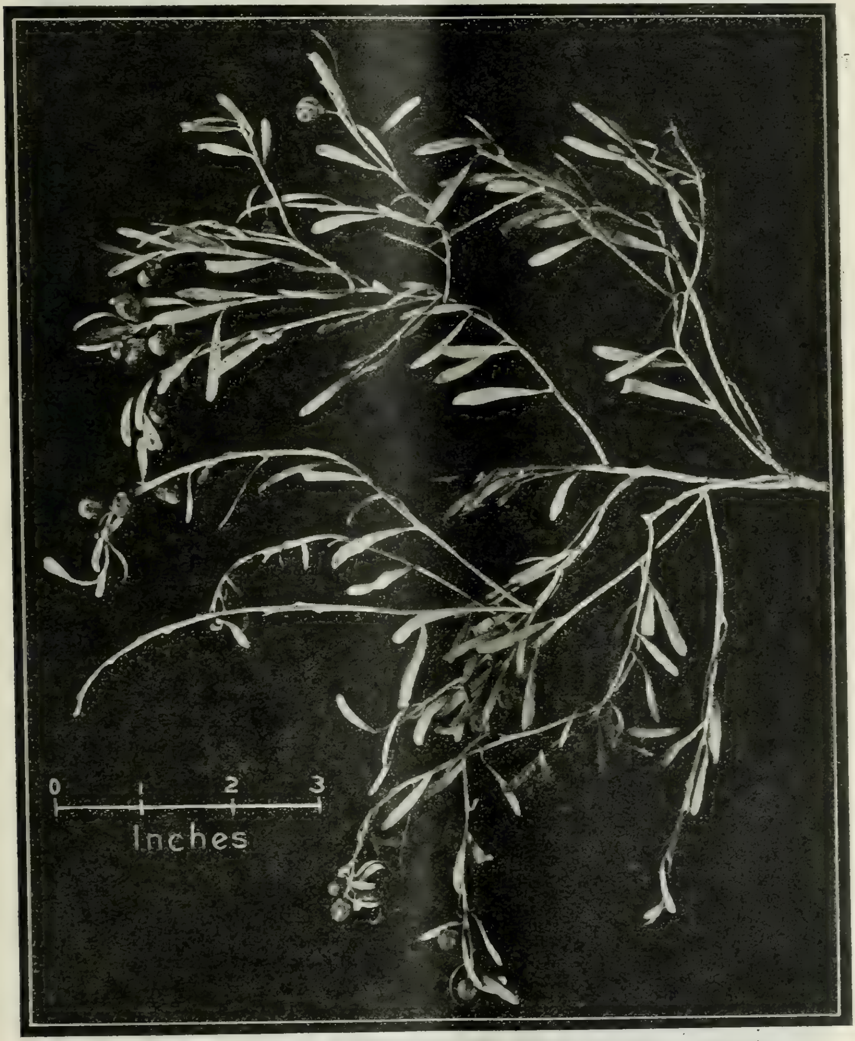

Fig. 2.—Branch of Native Lime, showing the foliage at the second stage of growth

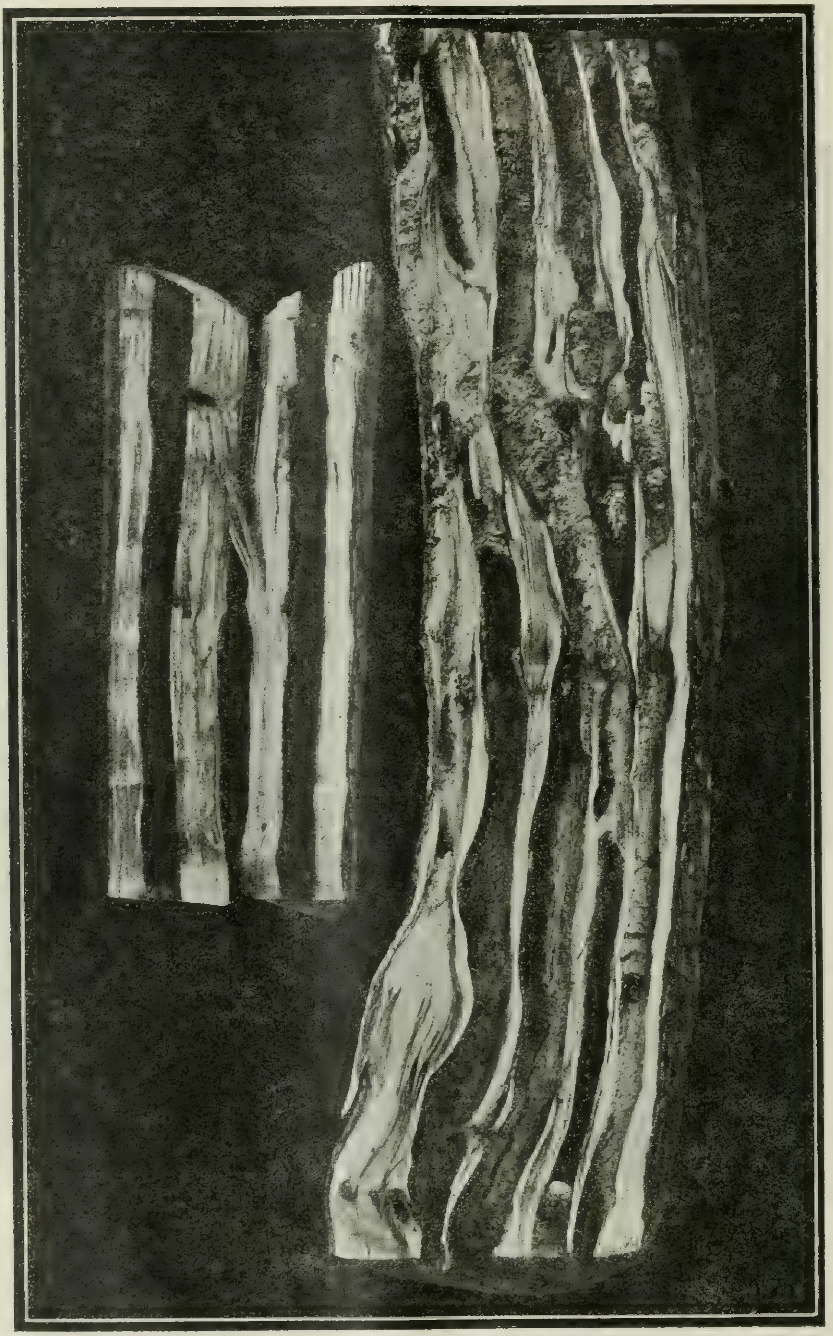

Fig. 3.—Stem of Native Lime, showing the damage caused by Longicorn beetle.

THE NATIVE LIME-TREE BORER.

and ventral surfaces of each segment bear a pair of large rounded tubercles occupying the whole surface of back and underside, each rounded and corrugated on the apex; the last two abdominal segments are small, irregularly rounded, and telescopic.

The pupa is of a general reddish-yellow tint, with nothing very characteristic about it that requires description to supplement the drawing of the life history of the beetle.

The beetle is very variable in size—the largest of those bred out is 1¼ inches in length, and it is broad in proportion; the smallest measures only ¾ of an inch. The true ground colour is dark shining brown, but the whole surface is so thickly clothed with buff-coloured pubescence and fine white hairs that it has a general greyish-brown tint. The pubescence on the antennæ is very fine, and almost golden on the terminal joints. The under-surface of the whole body is also covered with grey hairs, with still finer ones on the legs. The antennæ are long, composed of eleven joints; the third to the tenth narrow at the base, flattened and widened to the apex, furnished with a long spine on the inner extremity, and a smaller one and a few stiff hairs on the outer edge. The terminal joints taper off with reduced spines, to the elongate slender last joint. The thorax is rather short, roughly rounded, with a blunt spine on the sides. The wing covers show a regular pattern of snow-white patches of fine hairs, of which six (the two upper ones largest) stand out distinctly on the lower half; the extremities of the wing covers are arcuate with a fine spine on either side.

This beautiful longicorn beetle was not represented in any of our collections, so the writer forwarded it to Mr. A. M. Lea, of the Adelaide Museum, for identification. He reports that it is a new and undescribed species that will not fit into any established genus, and has therefore formed the above genus (*Citriphaga*) for its reception, and has sent his technical description of the new species—here appended—for inclusion in this paper.

CITRIPHAGA, n.g.

Head of moderate size. Eyes large, coarsely faceted, emargination fairly deep, upper lobe small. Mandibles short. Palpi small. Antennæ about the length of body, third to tenth joints each produced at inner apex, third to eighth each with a small spine at outer apex, eleventh about one and one-half the length of tenth. *Prothorax* not much wider than long, sides rounded and each with a small conical tubercle in middle. *Elytra* long, parallel-sided, each with two small acute spines at apex. *Legs* long and thin, front conal cavities open posteriorly.

A curious genus in some respects, near *Opsidota*, but with each elytron bispinose and prothorax armed at the sides; in catalogues it should be placed near *Aphanasium* and *Didymocantha*, which have armed prothorax but unarmed antennæ and elytra. The tarsi are apparently four-jointed, but the true fourth joint may be seen as a very small basal attachment to the claw-joint.

Citriphaga mixta, n.sp.

Black, some parts of derm of an obscure dark brown. Rather densely clothed with short, depressed, yellowish pubescence, mixed with a few white hairs; elytra with irregularly distributed white spots.

♂ *Head* with small, dense, partially concealed punctures; a strong ridge between eyes divided along middle; clypeal suture deep. Mandibles smooth about apex, but granulate elsewhere. Antennæ long, first joint stout and with dense punctures, second very short,

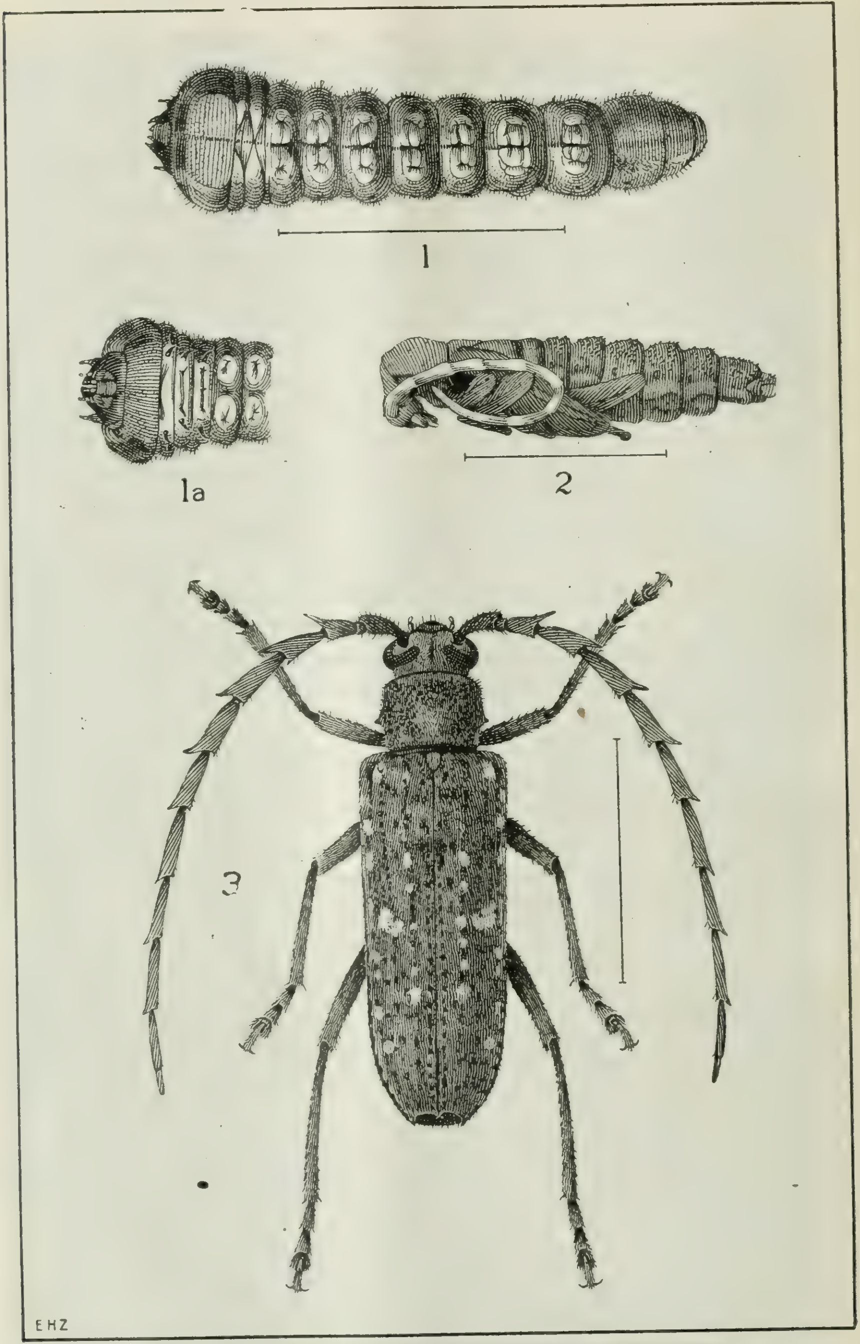

Fig. 4.—Life history of the Native Lime-tree Borer (*Citriphaga mixta*).
1. Larva—dorsal view. 1a. Ventral view of head and thorax, showing the legs. 2. Pupa.
3. Perfect beetle.

THE NATIVE LIME-TREE BORER.

third acutely produced at inner apex and with an acute outer spine, fourth to eighth gradually increasing in length, with the produced part at inner apex and the outer spine of each joint gradually becoming smaller, ninth and tenth feebly produced at inner apex and non-spinose, eleventh longer and thinner than tenth. *Prothorax* across median spines slightly wider than head across eyes, narrowly impressed across base and apex; with crowded, more or less concealed punctures and granules. *Scutellum* semicircular; with small concealed punctures. *Elytra* about thrice the length of head and prothorax combined, slightly wider than prothorax across spines, and much wider than base; each with two acute spines at apex, of which one is sutural; with crowded minute punctures, about base with numerous fairly large round ones, becoming smaller and sparser posteriorly. *Abdomen* rather wide and flat, first segment considerably longer than second, the others gradually decreasing in length. *Legs* long and thin, the hind ones conspicuously longer than the others; hind femora just passing fourth segment of abdomen. Length, 21 mm.

Hab.—New South Wales: Moree, reared from wild lime (W. W. Froggatt). Type (unique). I. 10,664, in South Australian Museum.

The white spots of clothing on the elytra are mostly small and sublateral, but there is a fairly large one extending about half way across each elytron about the middle; there is an appearance as of numerous small dark spots on the elytra and legs, due principally to the absence of pubescence from the larger punctures, but on the abdomen a similar appearance is due to small glabrous spaces; on the under-surface and legs the pubescence is rather longer and (except on the prosternum) paler than on the upper surface: on the antennæ the pubescence is very short and sericeous, but each joint (except the apical one) has a few apical hairs or setæ: each femur has a streak of yellow glandular pubescence along the under-surface, as in the males of *Uracanthus*, *Didymocantha*, *Aphanasium*, and allied genera. On the type there is a feeble notch and oblique suture on the eleventh joint of antennæ at about one-third from the apex, as if a twelfth joint was indicated, but this may be an individual variation as in many species of *Uracanthus*. Its first abdominal segment has a narrow impression across the apical third, but it curves round so that on each side it ends on the apical margin; as a result there appears, on a first glance, to be six segments, of which the second is much shorter than the first or third.

Imported "Rubbish."

WEED-INFESTED GRASS SEEDS.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

A STRIKING example of what would happen if no check were kept on seeds imported into the State is well shown by a consignment which quite recently arrived from New Zealand. The seed was supposed to be Yorkshire Fog grass (*Holcus lanatus*), but, as a matter of fact, only 88 per cent. was Yorkshire Fog, and the other 12 per cent. consisted of weed seeds, including noxious and harmful weeds.

In the first place Yorkshire Fog grass itself should be considered a bad weed, and it is surprising if a demand has been created for the importation of this seed. In America, in England, and in other progressive pastoral countries, Yorkshire Fog is considered a useless grass, possessing a negligible amount of nutriment, and noted for its ability to spread among and crowd out good grasses like Cocksfoot and Rye grass. As far back as 1895 Mr. Maiden turned the cold shoulder to this grass, publishing his warning in the *Gazette*. It is becoming very common on the South Coast of this State, where it is spreading through the good pastures.

It is a frequent occurrence to find tufts of Fog severely left alone by stock, while surrounding good grasses are kept closely cropped. Yorkshire Fog seed is a common impurity in Cocksfoot, Fescue and Timothy seed, thus providing already too much scope for the spread of the weed, without laying down pastures of the grass.

Assuming, however, that a farmer, through some unaccountable reason, felt disposed to introduce Yorkshire Fog, he would even then, by sowing such seed as that under review, lay up for himself an unlimited amount of trouble in disseminating the seeds of noxious weeds present in the grass. The tabulated list of weed seeds herewith, found in a pound of the grass, should frighten any farmer :—

Weed seeds present in 1 lb. of Yorkshire Fog Seed from New Zealand.

Hawk-weed (*Crepis capillaris*)	80,000
Sheep's Sorrel (*Rumex acetosella*)	3,840
Spurry (*Spergula arvensis*)	512
Rib grass (*Plantago lanceolata*)	640
Sow Thistle (*Sonchus asper*)	640
Catch-fly (*Silene gallica*)	384
Chickweed (*Stellaria media*)	2,560
Mouse-ear Chickweed (*Cerastium vulgatum*) ...	1,280
Rumex sp. (Dock)	320
Tutsan (*Hypericum androsæmum*)	640
Sherardia arvensis	128
Thlaspi arvense	192
Cat's Ear (*Hypochœris radicata*)	320
Cocksfoot grass (*Dactylis glomerata*)	48,000
Sheep's Fescue (*Festuca ovina*)	26,800
Crested Dogstail (*Cynosurus cristatus*)	1,280
Perennial Rye grass (*Lolium perenne*)	640
Trifolium dubium (a clover)	5,120
T. resupinatum (a clover)	2,560
T. tomentosum (Woolly clover)	768

The last seven mentioned are desirable plants to have in a pasture, but all the others are bad weeds, some like sorrel, dock, spurry, catch-fly and hawk-weed being particularly harmful. Hawk-weed is practically unknown here at present. It closely resembles a dandelion, but is annual or biennial in character, and is listed in the set of weed seeds issued by the New Zealand Department of Agriculture. It requires very little imagination to foresee how the weed would spread, when 80,000 seeds are distributed with each pound of grass seed.

The importation of this "rubbish" affords most convincing evidence of the urgent necessity of State legislation protecting the grower from impure seed.

Farmers' Experiment Plots.

POTATO EXPERIMENTS, 1918–19.

Murrumbidgee Irrigation Area.

G. G. POTTS, H.D.A., H.D.D., Assistant Inspector of Agriculture.

DURING the past season potato experiments were conducted on four farms with the co-operation of the following settlers:—

A. E. Cook, Farm 253, Leeton.
P. Gersbach, Farm 330, Leeton.
I. Dixon, Farm 543, Leeton.
H. Black, Farm 53, Leeton.

Although the yields obtained were not high, yet the results generally are gratifying when seasonal conditions are taken into consideration. The keenness of the experimenters was well marked, and these gentlemen are to be congratulated on their hearty co-operation and on the interest they displayed in the solution of problems of cultivation and irrigation practice during a spring and summer presenting such trying conditions.

The plots were sown under ideal circumstances. Good germination followed, and haulm growth during the early part of the season was most promising. The severe frosts in October cut the plots back twice, but a quick recovery ensued after harrowing, and little damage resulted. The early part of the spring was characterised by cold nights and incessant dry, hot winds during the day. The latter continued throughout the growing period. Low humidity and high evaporation in October and November necessitated irrigation at a time when great caution needed to be exercised in order to prevent the formation of second growth, so easily encouraged. The question at such a time, in a season similar to that just experienced, is, "Will second growth result from irrigation?" On the other hand, if irrigation is not practised the crop suffers considerably from the want of moisture, low yields follow, and a large percentage of the tubers are insufficiently developed for market purposes. The practice adopted with the plots was to irrigate once, except in one instance, when two applications of water were given. Second growth at each centre was negligible, but small tubers were much in evidence, due to growth being arrested. Much difficulty was experienced in retaining moisture around the plants, and in breaking down the crusty ridge formation that is so injurious to the development of the tuber. Hilling assisted largely in the direction of checking this crust.

The Season.

The past season has been characterised by abnormal conditions. The winter was comparatively dry, with severe frosts in July, extending into August. Seven frosts were registered in September, and three during the early part of October. In the latter month hot dry winds prevailed during the day, and cold nights were numerous. The severity of the wind was marked in November and December, there being the lowest humidity and highest evaporation yet recorded. Official figures show the following evaporation from a water surface: October, 5·458 inches; November, 9·354 inches; December 10·74 inches. The natural precipitation was of no value whatever during September to December. Only 1½ inches of rain were registered in Leeton, the result of scattered local showers of a few points at a time.

Although hot winds were common, late frosts were unusual, and these, together with the extremely high evaporation, presented many difficulties in regard to profitable potato culture.

Soil and Cultural Details.

At Farm 253 the soil was a light-textured sandy loam. Vegetables were cropped in 1916–17, and the land fallowed till May, 1918. It was then ploughed and kept cultivated till 23rd and 24th August, when planting was carried out. The sets were dropped behind the plough in rows 2½ feet apart, which constituted a sowing of about 12 cwt. per acre. The variety trial was manured with 2 cwt. of superphosphate per acre, spread in the rows at planting time. The land was tine-harrowed after planting.

Cultivation and irrigation during growth was as follows :—

Tine-harrowed across the crop—29th August, 6th, 16th, 22nd September.
Intercultivated—12th, 20th, 26th October, 5th and 17th November.
Irrigated in furrows—1st November.
Plots harvested—15th to 24th December.

The germination was excellent, and the early growth gave promise of good yields. Late frosts cut back the plants, but a quick recovery followed. The exceedingly dry conditions prevailing in the spring checked growth considerably, and although cultivation was carried out regularly, the plants suffered. The irrigation in November helped a little, but the moisture soon dried out, and as another irrigation would have encouraged second growth it was deemed advisable not to do so, and low yields resulted. A few rows of Magnum Bonum, which received a second application of water by accident, gave increased yields, but were badly affected with second growth and were unsuitable for market. Scab was manifested to a slight degree.

Of the varieties under trial, Factor appeared to be the most vigorous, Early Manistee looked promising, and Magnum Bonum produced very fine haulm growth, but the tubers set badly.

At Farm 330 the soil was a light sandy loam, virgin land, which was irrigated in April, 1918. A late ploughing was carried out on 19th August, followed with two harrowings. Planting took place on 27th August, furrows being opened out 3 feet apart and 5 inches deep. Manuring consisted of 2 cwt. superphosphate per acre, spread in the drills. The cultivation and irrigation during growth was as follows :—

Harrowed across the crop—20th September, 2nd October.
Intercultivated—12th, 23rd October.
Hilled with the plough—15th October.
Irrigated in furrows—20th October.
Plot harvested in stages from 26th November, 1918, to 9th January, 1919.

The germination was excellent, and vigorous haulm growth followed until it was cut back by frost in October. The plants soon recovered, however, and little damage was done. The hilling helped largely to prevent the formation of a crust between the plants. Of the varieties under trial, Brownell's Beauty, Early Manistee, Up-to-Date, and Factor grew most vigorously, whilst Manhattan was sparse in growth, only having an average of three stems per plant. The plot was affected to a small degree with scab, which was most pronounced on tubers growing where stumps had been burnt. Manhattan produced the largest tubers, and was least affected with scab. A large percentage were Black Manhattans. Up-to-Date gave average-sized tubers, and Early Manistee produced a large number of very small tubers, no doubt due to growth being checked through moisture requirements.

At Farm 543 the soil was a light loam, reddish in colour, and had carried pumpkins the previous season. The land was ploughed and harrowed in June, harrowed and rolled late in August. The plot was planted on 2nd September, furrows being opened 3 feet apart and 5 inches deep, and the sets were dropped 15 to 18 inches apart, constituting a sowing at the rate of 11 cwt. per acre.

Cut seed was used throughout. The furrows were covered with the single-horse cultivator and tine-harrows. Cultivation and irrigation during growth was as follows :—

Harrowed across the crop—9th October.
Intercultivated—21st and 28th October, 8th and 25th November, 9th December.
Irrigated in furrows—23rd October and 21st November.
Plots harvested—3rd to 10th January, 1919.

An early and excellent germination followed planting, but late frosts cut back the crop without any damage following. The soil on this farm dried out faster than in other centres, and on this account two irrigations were given. Second growth, however, was very slight, and no damage resulted from the extra application. The varieties were particularly free from disease, scab being present to a small degree. Up-to-Date again demonstrated its ability to yield comparatively well under trying conditions, and appeared to be slightly less vigorous in haulm growth than in other centres.

At Farm 53 a manurial trial was conducted on virgin soil, being a light red loam slightly heavier than at other centres.

The land was ploughed in April and fallowed throughout the winter, and again ploughed, graded and harrowed on 1st September.

Planting operations were carried out on 3rd September, when Carman No. 1 sets were dropped 15 inches apart and 5 inches deep in rows 3 feet apart. An excellent germination followed, the plants appearing above ground three days later. The frosts in October had no effect on the crop, and early growth indicated the value of manures, especially of P8 mixture. During the latter part of October the unmanured plots were 4 inches in height, whilst the manured stood 15 inches high, and were much more vigorous The dry conditions affected the crop to a large degree. After irrigation the plot looked promising, but the soil soon dried out, and although a second irrigation was advised, it was found impossible to carry out this operation, with the result that the plants suffered considerably and extremely poor yields followed. The experiment on this account was a failure, only an average of approximately 7 cwt. per acre being harvested. The tubers under each plant were numerous (an average of six per plant), but undeveloped, due to insufficient moisture. No conclusions in regard to the comparative value of manures could be drawn from the experiment. The cultivation and irrigation during growth was as follows :—

Harrowed across the crop—6th September.

Intercultivated—29th October, 10th November, 15th December.

Irrigated in furrows—2nd November.

Crop harvested—15th to 25th January.

TABLE A.—Showing Results of Variety Trials, Murrumbidgee Irrigation Area, 1918–19.

P. Gersbach, Farm 330, Leeton.

Variety.	Acre Yield.				Percentage of Marketable Tubers.
	t.	c.	q.	lb.	
Carman No. 1 (*check*) ...	2	12	1	22	62·92
Manhattan	3	6	0	11	78·30
Up-to-Date	3	16	0	24	78·30
Carman No. 1 (*check*) ...	2	3	3	17	69·57
Satisfaction	1	19	0	21	69·90
Brownell's Beauty ...	1	15	0	18	78·21
Carman No. 1 (*check*) ...	2	8	2	13	75·55
Early Manistee	3	0	0	1	70·54
Factor	2	17	2	17	77·00
Carman No. 1 (*check*) ...	2	12	1	0	77·50

I. Dixon, Farm 543, Leeton.

Variety.	Acre Yield.				Percentage of Marketable Tubers.
	t.	c.	q.	lb.	
Up-to-Date (*check*) ...	3	12	2	18	74·60
Early Rose	2	1	2	6	54·46
Magnum Bonum ...	1	11	3	6	61·31
Up-to-Date (*check*) ...	2	12	2	22	61·67
Manhattan	2	18	0	0	80·29
Factor	2	17	1	4	44·88
Up-to-Date (*check*) ...	1	14	0	0	60·50

A. E. Cook, Farm 253, Leeton.

Variety.	Acre Yield.				Percentage of Marketable Tubers.
	t.	c.	q.	lb.	
Early Rose (*check*)	2	2	1	6	83·16
Factor	2	8	2	19	74·60
Early Manistee	2	0	1	0	76·02
Magnum Bonum	1	18	3	7	89·52
Early Rose (*check*)	2	1	1	26	83·16

Up-to-Date, Manhattan, Early Manistee, and Factor have yielded comparatively well throughout the trials. Carman No. 1 and Early Rose have given fair results. Brownell's Beauty and Magnum Bonum are too late for planting on the Area; whilst the low yield of Satisfaction can be accounted for by premature ripening, due to moisture requirements, and it will be given further trial.

Varieties under Trial.

Carman No. 1.—A white-skinned potato, with fairly numerous shallow eyes, white sprouts and smooth skin. It is an upright grower, having pale green leaves and white flowers. The cooking qualities are very good. Its ability to yield is marked, and it is popular on the market. Being a medium early maturer, and having yielded consistently well for some time, it can be recommended for planting on the irrigation areas.

Manhattan.—A dark, purple-skinned, mottled potato, with a fair number of eyes, purple sprouts, and white flesh of good quality. The haulm growth is somewhat sparse, and dark green in colour, with heliotrope to pale purple flowers. It is a mid-season to early variety, noted for consistent yields and its comparatively high percentage of marketable tubers. This potato has justified its inclusion in further trials by its comparatively high yield during the past season. Black Manhattan, a variety frequently found amongst Manhattan, is a dark, purple-skinned potato, free from mottles, later in maturity, and possessing distinctly brown-coloured stems.

Up-to-Date.—An old-established, medium early variety, which produced the highest yields in all plots on trial last season. It is a flat, kidney-shaped, smooth, white-skinned potato, with very few shallow eyes. The sprouts are white, the haulm growth tall, vigorous, and medium dark green in colour, with pale heliotrope flowers. The cooking qualities are excellent, and the wastage in peeling is very small. This variety can be recommended for planting.

Factor.—An improved Up-to-Date, with similar characteristics of growth.

Early Rose.—A well-known early-maturing potato. The tubers are oval, having smooth red skin, numerous eyes, white flesh and pink sprouts. The haulm growth is dark green in colour, bushy and vigorous, with white flowers. This variety has been grown with success on the irrigation areas for some time, although not yielding as well as other varieties in the experiment plots this past season.

Satisfaction.—A red, rather rough-skinned variety, having few eyes. The shape is generally round and large tubers are strongly evidenced. The sprouts are pink in colour and vigorous. The haulm growth is bushy in appearance and light green in colour. This variety was under trial at one centre only, and ripened prematurely owing to moisture requirements.

Early Manistee.—A flattish, red, smooth-skinned variety, with few shallow eyes, pink sprouts and white flesh. The haulm growth is bushy, dark-healthy green in colour, with white flowers. The cooking qualities of this potato are high, and although not a heavy yielder, profitable crops can be grown. It is a comparatively new variety, and shows promise for the irrigation areas.

Brownell's Beauty.—This is an old standard red-skinned variety, having pink sprouts and white flesh of excellent cooking quality. The haulm growth is extremely vigorous, upright, and of a dark green colour, with white flowers. It is too late in maturity for the irrigation areas.

Magnum Bonum.—A late maturing, white-skinned, long, ugly-shaped potato, with numerous deep eyes and purple sprouts. The stalk growth is extremely vigorous and upright, with scanty leaf surface of a pale green colour. The root system was well developed with many dense fibrous roots, but the tubers set badly. This variety is too late in maturity for planting on the irrigation areas, and in any case holds no special qualification to warrant its culture.

Manurial Trials.

Manurial trials to test the efficiency of various fertilisers were conducted at two centres. The season was unfavourable to the economic use of fertilisers, as a fair percentage was undissolved at harvesting. Full benefit from them was not obtained; but in spite of this fact the results obtained on Mr. Cook's farm by the applications of superphosphate and P7 mixture are satisfactory. No apparent difference in haulm growth was noticeable, and the unmanured sections were quite as vigorous. This was contrary to the experience on Mr. H. Black's farm, where a marked difference in growth favoured the manures, especially in the case of P8 mixture. The latter experiment, however, was a failure, as previously mentioned. The results of the manurial tests are by no means conclusive, and further trials will be conducted.

TABLE B.—Showing Results of Manurial Trial on Farm 253, Leeton.

Manure per Acre.	Acre Yield.			
	t.	c.	q.	lb.
No manure (*check*)	2	3	0	14
2 cwt. Superphosphate per acre ...	2	2	1	6
2 cwt. P7 Mixture per acre	2	0	1	0
2 cwt. P8 Mixture per acre	1	8	3	0
No manure (*check*)	1	8	3	0

P7 consists of bone-dust and superphosphate in equal parts, and P8 of blood and bone (B. and B.) and superphosphate in equal parts.

Early Rose was the variety used. The comparatively high yield of one unmanured check plot is attributed to accidental seepage of irrigation water from vines nearby.

Spring Planting.

In view of the fact that spring planting of potatoes is considered rather a risky practice on the Murrumbidgee Irrigation Areas, and is rarely associated with high yields, the following points are worthy of consideration, and should tend towards the improvement of yields. Limited yields in the past have been due largely to dry hot weather prevailing when the tubers are setting, with consequent drying out of the soil, and the necessity for irrigation at a period when this practice needs careful judgment in order to prevent the formation of second growth and decaying of tubers.

These two evils are encouraged by injudicious irrigation—applying water in too large a quantity or at the wrong period. No hard-and-fast rule can be followed, but it is advocated that irrigation be discontinued after the tubers have reached any size, unless favoured with a cool change, when there would be less risk of injury. As the seasons are so changeable, keen observation on the part of the grower is a necessity.

In regard to the planting period for spring crops, it is considered that much earlier dates can be employed with safety, the object being to harvest during the cooler months, thus discarding the necessity of a late irrigation. It is proposed to conduct experiments in this direction next season.

The value of harrowing the growing crop is not sufficiently recognised. The general idea is that a number of plants will be destroyed by this practice, but that is not the case. It is quite safe to harrow across the crop till it is about 6 inches in height, with excellent results to follow. Harrowing with the tine or spiked-tooth lever harrow destroys weed growth, both in the rows and between the plants, preserves a soil mulch, and conserves moisture. This practice, together with inter-row cultivation, cannot be dispensed with if maximum yields are to be obtained. Hilling should be practised in order to prevent sun-scald and preserve a soil mulch, thus largely checking the formation of a crust, which is so evident in a dry season.

The rows must necessarily be wide apart to allow of adequate cultivation during the later stages of growth, and if necessary a light irrigation by seepage.

It is considered that having the rows 3½ to 4 feet apart is not out of reason.

The system of sprouting the seed in shallow trays exposed to the light, thus encouraging the development of short, sturdy, green shoots, is strongly recommended, as it hastens maturity to the extent of a fortnight, and will no doubt allow of later planting, with consequently less risk in regard to frost and cold weather. This procedure is eminently suitable for the conditions existing on the Murrumbidgee Irrigation Areas, where small areas are devoted to the culture of this crop. The practice of using immature seed from the autumn crop is sound; and potato growers should endeavour to select their seed in the field from healthy plants, producing large tubers, and growing under normal competition with other plants. There appears to be far too much laxity in regard to selection of seed in the field. Remember the axiom "Like produces like"; and when planting consider the fact that it is much wiser to plant tubers which you know will produce the highest possible yield than to gamble by planting seed derived from an unknown source and indiscriminately bulked as "seed." Certainly, when procuring seed on the open market, it is good business to purchase the largest tubers rather than those of a medium size, as the former came from a vigorous crop, whereas the latter may have been derived from a worn-out crop. In selection, the medium-sized immature tubers from plants producing abundantly should be reserved for seed.

The humus content of the soil is one of the main factors in successful potato culture, and under arid conditions, together with irrigation, this valuable constituent becomes depleted quickly. Provision must necessarily be made to replace and build up humus in the soil, either by ploughing under a green crop, or by the application of farmyard manure, straw, &c. A suitable rotation should in any case be adopted to keep up the fertility of the soil, and by no means should more than two crops of potatoes be grown in succession on the same land.

The practice of deep ploughing during the late autumn, and fallowing in the rough throughout the winter months, is strongly advocated. This releases plant foods, improves the mechanical condition, and conserves moisture—a big factor in the spring crop, as it may possibly assist in obviating the necessity for a second irrigation.

The use of an early-maturing variety is apparent, and such varieties as Carman No. 1, Up-to-Date, Early Rose and Manhattan can be planted with safety.

SALT LICKS AND ROCK SALT COMPARED.

DURING the shortage of rock salt, a trial of a proprietary salt lick was made by the Department at the Hawkesbury Agricultural College. The horses appeared to prefer the salt lick, while the cattle seemed to like the rock salt. Equal blocks of salt lick and rock salt were tried simultaneously, with both horses and cattle. The weekly consumption of the salt lick was about ·65 lb. per horse, while very little rock salt was consumed by them. The cattle, though taking to the salt lick, consumed less of it than the rock salt, the weekly consumption being 1·07 lb. rock salt as against ·57 lb. salt lick.

It is pointed out, however, that the consumption of so much rock salt may not have taken place, for while all the salt lick would be consumed, loss of weight in the rock salt may be accounted for by the elimination of gravel whilst licking, as rock salt at times incorporates large seams of this impurity.

Under the circumstances the use of salt lick may be recommended as a substitute for rock salt, provided the price does not exceed that of the latter by about 10 per cent.

Trials with New Wheats.

MARQUIS, HURON, MINISTER, AND COLLEGE HUNTER.

A. H. E. McDONALD, Chief Inspector of Agriculture.

DURING the past season the four wheats mentioned were given a fairly extensive trial. The consensus of opinion amongst the conductors of the experiments was that these varieties are all too late in reaching maturity to be suitable for our main wheat-growing districts. In the cooler portions of the State, such as the Tablelands, they promise to be useful. The yields, together with those of other main varieties for comparison, are given in the accompanying table:—

TABLE showing Yields of Marquis, Huron, Minister, and College Hunter in comparison with other wheats, 1918.

Locality.	Marquis.	Huron.	Minister.	College Hunter.	Yandilla King.	Federation.	Hard Federation.	Cleveland.	Bomen.	Rymer.	Bunyip.	Canberra.
	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb	b. lb.	b. lb.	b. lb.	b. lb.
Wagga Experiment Farm ..	7 22	14 10	12 30	9 30	19 40	..	19 40	..	20 40	..	..	..
Cowra Experiment Farm	15 16	14 40	19 36	16 27	25 0	22 36	24 0	..	..	26 0	..	28 0
Bathurst Experiment Farm—												
Mid-season sowing	27 30	..	..	25 30	26 20	22 20	28 10	29 20	..	..	..	24 40
Late sowing	21 40	..	..	24 10	25 20	21 30	25 0	26 50	..	..	..	25 40
Jennings Bros., Culcairn	..	14 35	..	..	19 38	18 10	..	..	..	..	..	..
H. G. M. Thackeray, Young ..	18 40	17 7	..	13 40	22 52	24 19	..	..	..	..	..	..
W. Thornton, Berrigan	..	19 56	..	..	21 20	24 24	..	..	..	..	..	..
J. Perry, Quirindi	..	9 2	..	Failed.	22 52	24 19	21 15	..	..	..	19 7	..
J. Parslow, Gilgandra	..	Failed.	..	..	..	15 1	..	..	..	..	..	..
D. A. Rich, Wellington	..	*19 44	..	..	..	30 40	26 30	..	..	..	..	..
H. M. Hall & Sons, Cunningham	..	..	..	14 42	21 26	24 9	..	..	..	..	..	..
R. O. Eulenstein, Henty	18 17	..	..	..	22 0	19 33	..	..	..	..	..	..
F. E. Kendall, Mayberry, *via* Culcairn.	..	..	..	15 29	17 19	17 39	..	..	..	..	..	..
J. T. Maunder, Pallamallawa ..	4 32	..	..	..	..	10 6	..	..	..	..	..	12 46
J. Plumb, Crookwell	20 4	..	..	..	18 43	..	..	25 30	..	..	..	..

* The Huron seed wheat was grown by Mr. Rich himself.

Marquis.

This variety, which has given remarkably high yields in Canada, did not prove satisfactory under the conditions which prevailed in our main wheat-growing districts during 1918. Although the latter part of the season proved dry, the conditions were nearer normal than those of the two previous years.

It was later in reaching maturity than the late varieties which are usually grown in this State. It is a good stooler, of procumbent growth for a long period, and finally it rapidly produces top growth and reaches a fair height.

Huron.

This variety, the seed of which was received from Sir Joseph Carruthers, is a bearded wheat of the durum type, with long hard grain. It is a prolific stooler, and its period of maturity is longer than that of even our late varieties such as Marshall's No. 3 and Yandilla King. In normal seasons it is too late for the chief wheat-growing districts; grain harvested last season was slightly pinched, whereas the sample produced by the varieties under general cultivation was very good. Furthermore, the yields were much inferior to the varieties generally grown. In the North-west difficulty was found in harvesting and several "chokes" occurred.

Minister.

This variety in our tests germinated rapidly, but the subsequent growth was slow and the stooling was only fair. The straw was strong and clear, and it stood up well. In appearance it is somewhat similar to Currawa, but the heads are more clubbed. At Cowra Farm the grain harvested was on the small side, but it was well filled and plump. In appearance it is hard and flinty and very clear in colour. The grain is well held in the ear, but threshes well.

This variety was obtained from the Dookie Agricultural College in Victoria.

College Hunter.

This variety was received from the Canterbury Agricultural College, New Zealand. It has been grown in New Zealand for fifty years under the name of "Hunter White," or in some localities "Red Chaff." It is not considered to be the "Hunter White" of England, and nothing is known of how it came to New Zealand nor what wheat in England it is descended from. It was grown in New Zealand absolutely without selection for fifty years, till 1910, when F. W. Hilgendorf, of Canterbury College, undertook pure strain selection work with it. In five-year trials it yielded an average of 9 bushels per acre more than commercial seed; and during the past seasons of 1915, 1916, and 1917, since it has been distributed all over Canterbury, it yielded on an average 4 bushels per acre more than the farmers' own seed.

At Cowra Farm it was noted that the germination was very good, but the growth was very slow and the stooling was only fair. The growth is erect, with strong tough straw, and it resisted rain and wind well.

It is very late in maturity, and at Cowra was the last to ripen. The grain is loosely held and is likely to shell. The grain was rather small, slightly pinched, and very soft.

The general opinion of those who conducted the tests was that it was too late in maturing to be suitable for our main wheat districts.

It was noticed at Cowra that after a portion was cut for hay a very rapid second growth was made, and it might therefore prove a useful variety to sow for green feed.

Marquis Wheat.

J. T. PRIDHAM, Wheat Breeder.

THIS variety originated in Canada, and was bred for the special conditions of that country. It is the result of a cross between Red Fife or Manitoba wheat and an Indian variety. Marquis ripens earlier than Fife, and does not shed its grain so easily; it is an excellent milling wheat, well adapted for mixing with our soft grain varieties, but unless an advance of 6d. per bushel can be obtained for the grain, we consider it will not pay farmers to grow the variety, as, in our experience, it is only a moderate yielder. The grain obtained from the seed branch was first sown at the Cowra Farm in July, 1912; also at Glen Innes and at Wagga in the same year. It was noted at the lastnamed farm as maturing too late for the district, and the yield was only moderate.

Results in 1913.

In 1913 it was sown at Cowra on 9th July—the yield would have been better had it been sown earlier. At Wagga it yielded 1 lb. ¼ oz., the nearest check plots of Federation yielding 1 lb. 14½ oz. and 1 lb. 11½ oz. respectively. It was sown at the Bathurst Farm, but the plot was not weighed, the yield being poor. At Glen Innes it was favourably noted as a promising wheat.

Results in 1914.

In 1914, at Cowra, the heads tipped badly, and the grain shed to some extent. At Wagga it was found to mature too late; the plot was destroyed by birds. At Bathurst it yielded 1 lb. 10½ oz. grain, as compared with 1 lb. 14½ oz. and 2 lb. 10¾ oz., respectively, from the nearest check rows of Cleveland. At Glen Innes it failed to come up to expectations; the heads were fuzzy, containing, for the most part, no grain.

Results in 1915.

In 1915 the heads were tipped at Cowra, the plants stooling heavily. At Wagga it yielded 4½ oz., as against 1 lb. 8½ oz. and 14½ oz., respectively, from the nearest plots of Federation, the check variety; the grain was pinched, and the heads tip-withered badly. At Bathurst it gave a fairly good account of itself, yielding 2 lb. 8 oz., as compared with 2 lb. 12 oz. and 2 lb., respectively, from the nearest check rows of Cleveland. It should be mentioned that the Marquis was grown between two late-maturing Fife wheats which yielded poorly. At Glen Innes the plot was rejected, the yield being poor.

Results in 1916.

In 1916, at Cowra, Marquis was noted as ripening at the same time as Genoa wheat; it did not yield well enough for the bulk to be harvested. At Wagga it gave 11¼ oz. of seed, while Federation, which did poorly this year, returned 14 oz. and 12½ oz., respectively, in the nearest check rows. At Bathurst, Marquis yielded 2 lb. 4 oz., the adjacent check plots of Cleveland giving 3 lb. 10 oz. and 2 lb. 13 oz., respectively. At Glen Innes it produced 16¼ oz., as against 1 lb. 5 oz. and 1 lb. 14 oz. yielded by adjacent plots of Genoa.

Results in 1917.

In 1917 Marquis came eighty-sixth in order of yield at Cowra, the total number of varieties tested being ninety-six. At Wagga it yielded 2 lb. 2¼ oz., while Federation in the adjacent rows gave 2 lb. 10¾ oz. and 2 lb. 8¼ oz., respectively. At Bathurst it gave good yields this year, yielding 1 lb. grain, as against 1 lb. 1½ oz. of Cleveland, on the average. At Glen Innes, in a trial of twenty varieties, Marquis came thirteenth in order of yield.

The 1916 and 1917 seasons were favourable to the variety, affording a good rainfall. Fresh seed was obtained from Winnipeg, through the courtesy of Sir J. H. Carruthers, since the first importation in 1912, but no appreciable difference was seen in the growth of the different strains. A very large number of plots are sown each season at the different experiment farms, and we endeavour to reduce the work at harvest time by threshing in bulk only those plots which are included in our "stud variety trial." Imported wheats are introduced into these trials if they yield satisfactorily. Notes are made on the behaviour and characteristics, and selected plants saved for seed without harvesting the entire plot. We may conveniently use numbers to represent the crop, for the purpose of tabulating the results, thus:—Very poor, 1; poor, 2; fair, 3; good, 4; excellent, 5.

Grown at—	1912.	1913	1914.	1915.	1916.	1917.	Average.
Cowra	2	2	2	2	2	1	2
Wagga	3	2	1	1	2	3	2
Bathurst	...	2	3	4	3	5	3½
Glen Innes	2	4	1	2	3	3	2½

Results in 1918.

These are not available at the time of writing, but the season was one favouring early maturing varieties only; so that Marquis because of its relative lateness in heading did not succeed so well as it did in 1917.

The yields of Marquis wheat for 1918 at various experiment farms and on the Farmers' Experiment Plots are given elsewhere in this issue.

Experience in the United States.

In this connection it may be of interest to note the conclusions of R. B. Carleton and C. J. Allen in Farmers' Bulletin 732, Department of Agriculture, U.S.A., published in 1916:—

> Marquis wheat is a hybrid produced by Dr. William Saunders and Dr. C. E. Saunders at the Central Experiment Farm of Ottawa, Canada. It is one of the progeny of a cross made about 1892 between an Indian wheat, Hard Red Calcutta, as the female parent, and Canadian Red Fife. The different forms obtained from this cross were separated in 1903 at Ottawa, and one of them, selected between 1905 and 1907, was

called Marquis. On account of its good milling qualities, this wheat was sent to Manitoba in 1906 to undergo cultivation tests. Its earliness enabled it to resist the rust that so ravaged that province in 1907. Soon it became one of the chief varieties grown in Manitoba and Saskatchewan. The yields obtained from this wheat at the agricultural experiment stations of these provinces for the eight years 1907 to 1914, were from 13·5 to 38 per cent. higher than those obtained from Red Fife.

Marquis wheat is a beardless spring wheat with hard straw and chaff and a red, hard grain. It has the appearance of the wheats belonging to the Fife group of the northern Great Plains States, and is therefore classified in that group. It is an early variety, ripening 98 to 135 days after sowing, according to the district and year ; its average growing period in the northern Great Plains is 115 days, so that it is three or four days earlier than the other Fife varieties.

Thanks to this earliness it is able to a certain extent to resist drought in dry years, rust in wet years, and early frosts which, in this northern district, sometimes overtake wheat at the period of ripening. These characters make it a very valuable wheat for Canada. As the season favourable to growth increases as one goes further south in the United States, earliness becomes of less advantage.

Experiments with Marquis wheat have been carried out at the experiment stations of thirteen States, from Iowa to Minnesota in the east, to Oregon and California in the west. In this vast stretch of land the adaptation and value of the new variety vary with the local conditions. This part of the United States may be separated into four divisions according to the chief conditions of the districts—(1) the Northern Prairie or sub-humid zone; (2) the northern Great Plains or semi-arid zone; (3) the western Basin and the Coast or arid zones ; (4) the irrigated districts of the northern Rocky Mountain region and great Basin zone.

A. *Value in the Sub-humid Zone.*—Wherever possible winter wheat should be grown, the Marquis variety may be recommended. The varieties of Fife, Bluestem, and Preston grown should not be hastily discarded ; the Marquis should be compared with these spring wheats and the best one chosen.

B. *Value in the Semi-arid Zone.*—(1) The winter varieties are best wherever they can be grown in the north of the Great Plains districts ; (2) durum wheats are better than any common spring wheats in this zone ; (3) Marquis is better than any other variety of common spring wheat in some parts of this zone, and equal to any throughout the district. Where spring wheat is grown and durum is not used, Marquis is a safe variety to cultivate.

C. *Value in the Arid Zones.*—The dry lands of the States west of the Rocky Mountains are included in the arid zones. Marquis wheat is not to be recommended for this district.

D. *Value in the Irrigated Zones.*—Marquis wheat has not yet been largely grown in the irrigated valleys of the western States. According to the information available it has given good results in western South Dakota and in Montana. In Idaho and Nevada the soft white spring wheats, such as Dicklow, Defiance, Palouse, Bluestem and Little Club, all outyielded Marquis under irrigation.

Milling Value.—Marquis is a first class wheat for flour-making, being at least equal to Fife and Bluestem in this respect.

STUD FEES FOR DEPARTMENTAL STALLIONS.

In connection with the fees and conditions for the use of stallions at the North Bangaroo Stud Farm, Canowindra, it has now been decided that Clandale's fee be 7 guineas per mare, and Royal Warden's fee 6 guineas per mare.

Any number over two from the same owner will be charged 6 guineas and 5 guineas each respectively.

Agistment, 2s. 6d. per week per mare.

Free service will be given the following season to all mares that fail to get in foal from previous season's service.

No further concession will be made if the mare fails to get in foal after the second season's service.

Oats under Irrigation, 1918.

YANCO EXPERIMENT FARM.

E. FURBY, Experimentalist.

[The Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw the attention of farmers to the fact that the following results only refer to one year, and cannot therefore be considered as in any way final. It is felt that, though no definite conclusions can be drawn from the one year's results, the figures are of sufficient interest to warrant publication at this stage, and may act as a general guide.]

CONTINUING these experiments during 1918 to further determine those varieties most suited to the district, and more particularly those best adapted to irrigation, some very satisfactory yields have been obtained. Although lacking somewhat in contrast they are unusually consistent, there being only two varieties whose yields do not reach the 100 per cent. standard of the check plots.

Perhaps the main contributing factor to this similarity in yields is the unusual evenness of the soil used for the experiment, as evidenced by the small difference in yield of the check plots. This ground had, since 1908, been continuously under lucerne. This, too, must have a decided influence in producing that uniformity of soil throughout the paddock, both biologically and, to a certain extent, mechanically.

No opportunity was afforded in this trial to study minutely the effects of continuous irrigation on the different varieties. The winter here being unusually wet no irrigation is required except, perhaps, towards the latter end of the growing season. Such was the case with this trial, and hence it cannot be strictly regarded as a trial under irrigation conditions.

Two other varieties were included in the trial which were not grown the previous year, namely, White Tartarian and Red Rust-proof. The former, a late-maturing variety, justified its inclusion, while the latter proved its unsuitability to these conditions and climate, so much so that a further trial should be hardly necessary.

Algerian, which has yielded well in past years, was again used as the check variety.

All varieties were sown on 10th May, 1918. The soil had been previously graded, check banks made, and checks watered and cultivated just prior to planting, thus producing a well-worked and moist seed-bed. Seed was sown at the rate of 56 lb. per acre, and superphosphate at 60 lb. per acre was used. The area of each plot was ·3, or nearly one-third, of an acre; the whole of the plot being weighed for the estimation of the yield. All varieties germinated well.

TABLE showing Results of Oat Variety Trial, Yanco Experiment Farm, 1918.

Plot No.	Variety.	Plot Yield.	Computed Acre Yield.				Percentage Yield.	Date Harvested.
		lb.	t.	c.	q.	lb.		1918.
1	Algerian (*check*) ...	2,029	3	0	1	15	100·0	6 November.
2	Ruakura...	2,327	3	9	1	0	109·8	28 October.
3	Guyra	2,490	3	14	0	12	112·8	2 November.
4	Algerian (*check*) ...	2,295	3	8	1	6	100·0	6 ,,
5	Sunrise	2,173	3	4	2	19	97·7	28 October.
6	White Tartarian ...	2,287	3	8	0	7	106·2	19 November.
7	Algerian (*check*) ...	2,080	3	1	3	17	100·0	5 ,,
8	Lachlan	2,229	3	6	1	10	105·4	2 ,,
9	Red Rust-proof ...	1,784	2	13	0	10	83·0	2 ,,
10	Algerian (*check*) ...	2,182	3	4	3	21	100·0	5 ,,

The Season.

The season generally was most favourable to winter-growing crops, especially so in the earlier part, when the occasional showers brought the crop along very steadily without a check. Excessive rain was not experienced as in other years. The rainfall for the growing period, amounting to 774 points, was not sufficient to carry the crop in a succulent stage to harvesting. The heaviest total fall was recorded in August, with 233 points. No rain of any consequence fell after August, but a most trying time was experienced in the continuous strong drying wind during the latter part of August and throughout September. It was found necessary to irrigate on 24th September at a stage when the heads were beginning to make an appearance. The soil was given a thorough soaking, but even this was not sufficient to mature the crop evenly. Another watering would have resulted in the loss of the greater part of the crop through lodging, so further irrigation was deferred.

Suitable dry weather prevailed for harvesting.

No noticeable detrimental effects as the result of irrigation were observed. All varieties responded well to the water excepting Red Rust-proof, which appeared to remain at a standstill. There is no doubt that had a second irrigation been possible the yields all round would have been greatly enhanced. With the exception of White Tartarian, there was no evidence of rust, while no loss was incurred through lodging.

The Varieties.

Algerian.—A late-maturing variety, which has given good results on this farm for a number of years. It stools well and has a very large amount of foliage. It should be suitable for all purposes.

Ruakura.—This variety matures fairly early. It is not quite so fine in the straw as Algerian, but stools as well. It made a good growth after irrigation, reaching a height of 4½ feet. It may be put on the level of Algerian for an all-round oat.

Guyra.—Besides doing well in the colder districts this variety has proved itself here. It is inclined to grow very rank, the straw being coarse and devoid of leaf. It stools moderately well, and is ready to harvest one week before Algerian.

Sunrise.—This oat is somewhat similar to Guyra in habit of growth. It is a very tall, upright-growing variety, reaching 5 feet in height. In the young stages of growth this oat looked very promising, but was afterwards disappointing. It does not stool too profusely, but carries a large amount of leaf. It is said to lodge very badly, but such was not the experience here. It matures about two weeks before Algerian.

Lachlan.—This variety appears to be very suitable here. It stooled well and was exceptionally even in growth, reaching 4½ feet. The foliage, which is dark green in colour, is plentiful, while the straw is moderately fine. This variety matures very little earlier than Algerian.

White Tartarian.—Of the varieties under trial this is the latest to mature, and so should be planted early to obtain the best results. It should be suitable in this district for feeding off. While in the young stages it makes very slow headway. It is a moderate stooler, with medium straw, carrying a very large amount of flag. It is fully worth a further trial.

Red Rust-proof.—This variety matures with Lachlan and Guyra. It made very poor growth and gave a low yield. It is slow-growing and very uneven. The straw is fine, growing to 3½ feet. It is only a moderate stooler, and does not appear to be suitable for this district.

DERMATITIS IN DAIRY CATTLE.

AN interesting skin disease among cattle has recently been brought under the notice of the Chief Inspector of Stock by Mr. Stock Inspector Mater, of Braidwood.

On a South Coast farm, on parts of the white patches only, of ten of the cattle, there suddenly appeared a reddish tint, which gradually spread over the white parts, followed by slight swellings, and after a while the skin cracked and eventually peeled off. In some cases the teats became very sore.

The matter was investigated by Dr. S. Dodd, D.V.Sc., F.R.C.V.S., of the Veterinary Pathological Laboratory of the Sydney University. He found that thirty head of cattle and four horses were being run on the property. Drought conditions were bad, practically the only feed in sight being on a small dried-up swamp on which, however, couch grass was growing abundantly and a little feed in a cultivation paddock. On the former the only herb of any account was a small amount of "Smart weed" (*Polygonum hydropiper*); this, however, showed no evidence of having been eaten. In the latter there was nothing beyond a little couch grass, stramonium, and "Fat hen." The paddocks and scrub were grazed down so closely to the ground that it was impossible to pick out any particular plant. A good deal of bracken was present in different places, but up to the time of his visit the cattle had not touched it to any extent.

Examination of the herd showed that ten in all were affected with the skin trouble, but all in a late stage, most of the lesions being in a state of resolution. The lesions were all situated on the white, or more correctly speaking, the unpigmented areas of the skin. Cattle without such areas were quite unaffected. The parts of the body were mainly the upper, *i.e.*, those parts most exposed to the sun's rays, and also the teats. Most of the lesions were masked by the dressing which the owner had applied, but so far as could be ascertained it was quite a superficial dermatitis, and confined to the before-mentioned parts. In several instances the condition had been complicated by the animal biting the part, or rubbing against posts, &c., no doubt in order to relieve the irritation occasioned. In some instances the teats had been very severely affected, relatively large patches of skin having sloughed off, leaving raw ulcerated patches. This rendered it difficult, or even impossible, to milk the cows so affected.

There were no deaths, but the economic loss to the owner has been considerable. In addition to the loss of milk from animals with affected teats, he found that people refused to purchase the butter. Various reasons were given, but it was really because they were afraid of contracting some disease, which of course was quite fallacious.

The irritation caused by the dermatitis also resulted in a very considerable loss of condition; this was proved to be quite irrespective of the bad season, as such animals could be compared with the unaffected ones running on the same area.

In Dr. Dodd's opinion the condition was a dermatitis arising from the ingestion of some skin-sensitising plant. The disease is somewhat similar to that recorded by him as primarily due to trefoil in the North-west. No trefoil existed on this farm, however, but it is well known that quite a number of plants of different species are capable of sensitising the skin to the sun's rays. The identification of any plant was, however, quite impracticable on the farm, as everything had been so closely grazed to the ground.

On making inquiries in different localities, Dr. Dodd learned that this condition of the skin had been observed quite a number of times in different years. The information, however, was very meagre, as no one had taken much interest in it, and most looked upon it as just ordinary sunburn. It is quite probable that the unusual incidence of the form of dermatitis this year as reported here is due to the fact that the cattle, being unable to get sufficient food from the ordinary herbage, had to graze on practically anything, and the skin-sensitising plant or plants were among them.

As regards treatment, no drugs are needed, but it is necessary as a preventive to cover the skin with a solution of permanganate of potash, or a mixture of castor oil and lamp black, or any dark non-irritating substance. The teats of milking cows should be bathed in a solution of permanganate of potash.

The Autumn and Winter Management of Bees.

W. A. GOODACRE, Senior Apiary Inspector.

GREATER attention should be given by the majority of apiarists in preparing their colonies for the hardships of winter, and to enable them to come into spring with a minimum of loss and a maximum of population. Many apiarists state that they have had practically no loss, in spite of the lack of preparation; but it is found in the majority of such cases that a loss has occurred in the population of the colony. Bees require less attention than most things on the farm, but what is required must be given. The practical man will prepare his colonies for winter during summer and autumn; for in this industry it is necessary to prepare for the future, and thereby save many colonies that would otherwise perish through lack of foresight and consideration on the part of the owner.

Autumn Management.

In the autumn the colonies should be prepared for winter, and first of all it will be necessary to have a considerable number of young bees capable of the prolonged work of heat generation and for the purpose of starting extensive brood-raising in the spring. To obtain the young bees we naturally look to the queen, and favourable brood combs in the brood nest. This is the time to replace any failing queen bee, also any queen completing her third season. A failing or unsatisfactory queen can be distinguished by notice and comparison in the brood nest; for instance, a sprinkling of drone larvæ will often be found in the worker cells (the top of these cells when capped will be bulged to the shape of a ·22 rifle bullet); the queen in this case will have a worn-out appearance. In other cases the brood will not be packed, as will be noticed where a vigorous queen is present. The progress of the colony should be noted for some time, and the failing or old queens should not be allowed to remain long enough to decrease the population.

At all times care should be taken to have selected combs in the brood nests. If combs containing many drone cells are noticed during the autumn they should be removed to the outer edge of the brood nest, and when an opportunity arises, such as a honey-flow combined with favourable weather, such combs can be removed and used for honey storage only; they should be replaced with full sheets of comb foundation in the brood nest.

During extracting in the autumn many combs containing emerging brood will be noticed in the supers of populous colonies; many of these can be used to strengthen the weaker colonies. Use judgment in this and do not retard the progress of the populous colonies to any extent; it should only be a matter of taking one frame containing a fair patch of emerging brood from each colony. There are apiarists who try to assist weak colonies by giving unsealed brood; this is a great mistake, as the colony generally has as much as can be cared for, and this extra strain placed on them will result in a good deal of neglected and chilled brood.

Care must be taken to have ample stores available for winter months; generally one full super and what is naturally contained in the brood nest will be sufficient and will give a good start for extensive brood-raising in the spring. If ample stores are not left in the hive, it will induce the bees to become economical and come into spring with less vigour.

All surplus supers should be taken off, and the colony left with as much space as can accommodate the bees comfortably; when a colony is left with too much space and the hive not adjusted to prevent a draught, the bees eat more than should be necessary in order to keep up the temperature; this will often cause dysentery and heavy losses through "spring-dwindling" later.

Coming on winter many apiarists contract the entrances to the extent of only allowing a few bees to pass out at one time; this is a mistake, and may result in having mouldy combs in the spring. Bees need a certain amount of fresh air; a ⅜-inch entrance, full width, will not be too much for the average colony. All other openings should be plugged, so as to prevent a draught through the cluster of bees.

Insulating material, such as ruberoid and good sheets of paper placed over the frames just before the winter, is advisable; if paper is used it should be removed early in the spring as the bees will tear it to pieces. The cover should be sound, and an extra covering of good sound bark is advisable; this bark when properly stripped and cleaned does not spoil the appearance of the apiary by any means. Colonies of less than four good frames of bees should be united; this can be done by placing a sound sheet of newspaper between them. This will prevent the bees immediately attacking each other, and by the time they nip their way through the paper, and unite gradually, they become reconciled. It is best to unite colonies after the bees have finished the day's work.

Colonies which cover four or five frames can often be wintered successfully by placing a follower or division board and pack paper in the space between the follower and the wall of the hive, having a good sheet of brown paper over the frames; such a colony should have ample stores. Colonies found to have insufficient stores for winter can be given frames of honey from other colonies, or fed with sugar and water made up as outlined later.

Winter Work for the Apiarist.

There are localities in New South Wales where bees gather surplus sufficient to warrant the apiarist using the extractor during the winter months, but this only occurs in warm localities and is not general. In the majority of places the bees should be left severely alone until activity is resumed in the spring. There will be a considerable amount of work during winter, such as preparing hives, tins, &c. As many apiarists use benzine tins as a container this will be the time to obtain a stock; they should be washed and the tops soldered ready for use.

Great care is necessary in washing the tins. This is a good method :—Take 8 gallons of water, 1 tablespoonful of carbonate of soda, and a small piece of soap, bring to boiling point and stir well. About one quart should be poured into each tin, then give a good shake to get the solution into all corners. If no washing machine is available this can be done by hand if the hands are protected, for the tin becomes very hot. The solution can then be poured into other tins, giving double quantity. The tins should be immediately rinsed with cold water in the same manner, and then placed in the sun, the opening of tin at the lowest if possible; the tins can be dried out later, and still kept in the sun. This one treatment will suffice generally, but further treatment is at times necessary; there should be no odour of benzine in tins to be used as honey containers.

Frames can be made up and wired, but it is not advisable to place comb foundation in the winter.

The Artificial Feeding of Bees.

There are indications at present that apiarists in some localities will need to resort to artificial feeding of their bees, in order to supply the necessary winter stores; also in other cases where there may be a lack of stores. It is therefore advisable to consider the different methods of feeding, the class of food suitable for bees, and the effect according to existing conditions.

Class of Feed.

This may consist of (1) honey, secured from an apiary known to be free from disease, or (2) syrup, made from good cane-sugar and water.

To make the syrup use one part of sugar to one part of water by volume; boil the water, then add the sugar a little at a time, keeping well stirred, until all the sugar is dissolved. If this class of food is to be given late in the autumn in cool climates, add two parts of sugar to one of water. Honey is not necessary in this syrup, but 1 pint to 4 gallons will be an improvement.

Serviceable Feeders.

If the feeders are to be purchased from the factory, the "division board feeder" is recommended for supplying winter stores, and the "simplicity" for supplying stimulating feed. If expense is a consideration, use any sound container that will fit in the super or hive, and allow access by the bees; if tins are used it will be necessary to place pieces of board to prevent the bees from being drowned.

Method of Placing Feeders.

Place an empty super on the hive, and a mat over the frames, allowing some space at each end for the bees to pass. Another method is to remove a few frames to allow of sufficient space for the feeder; an empty super and mat will be unnecessary in this case.

The Use of Stimulating Feed.

This class of feeding will induce brood raising, and should only be given under favourable conditions, such as when the weather is mild, and not likely to change for some time, and when at least a small quantity of pollen is being gathered (no nectar). It should not be given in the month of April unless in a warm climate.

Give about 1 lb. of the honey or syrup daily to the average colony; if candied honey is used, give about 2 lb. every third day. If the conditions are favourable, the apiarist will be well repaid for his trouble by having a large number of young bees ready for the hardships of winter.

Feeding for Winter Stores.

Feeding for winter stores should take place late in the autumn, when it is considered that there is no chance of a further flow of honey. The food should be given in large quantities, making a total of not less than 25 lb. in not more than three days to the average colony. In case the colony has insufficient stores, the quantity can be regulated to increase the total weight to about 25 lb.

Lack of Stores during the Season.

Feeding on account of lack of stores can be done in the same manner as for winter, only that a smaller quantity would be necessary; for instance, if the honey flow is expected in about six weeks, then about 10 lb. would be sufficient. It is not advisable to give more than 10 lb. at any time; the bees can be fed again if conditions warrant such a course.

"POULTRY FARMING IN NEW SOUTH WALES."

A THIRD edition of this little handbook has just been made available by the Department, and will be welcomed by all who are engaged in the industry or are studying its possibilities.

Considerable additions have been made to the previous issue (of which nine thousand copies were sold within two years), and many of the articles and notes which have appeared in the *Gazette* have been incorporated.

Mr. Hadlington has embodied in this publication the result of many years' experience in commercial poultry raising, and it is safe to say that no poultry farmer in the State can afford to be without the benefit of the information thus made so easily accessible.

The booklet is copiously illustrated, and contains many plans and specifications of the most suitable and economical types of buildings.

In spite of the substantial increase in size the price remains unaltered at 1s. per copy or 1s. 1d. post free from the Government Printer.

Poultry Notes.

APRIL.

JAMES HADLINGTON, Poultry Expert.

DURING the last few months the poultry-keeper has been passing through another very trying period in respect of food supply. Not only have the materials for making the usual morning mash been very high in price, but they have been difficult to procure. Coincident with this has been the difficulty of growing green food, which, if obtainable, would have materially assisted in tiding over other shortages. Both these troubles have arisen through the recent drought conditions. The position is this, that when drought times come all foodstuffs become scarce from the fact that the dairyman and flock-master have recourse to pollard and bran, thus creating an abnormal demand. The result is that the poultry-farmer, in common with all users of these materials, finds it difficult to procure sufficient supplies The rather serious position thus caused is constantly receiving the attention both of the Department and of leading men in the industry ; but the solution of the difficulty is a problem that it is feared will be difficult to overcome during these recurring periods of drought. The situation has been somewhat relieved by the production of a wheat-meal by the State Wheat Board, otherwise it would have been still more acute. However, with the beneficial rains that have fallen in many districts the position should now improve, as less mill offal will be needed for cattle and sheep, and the growth of lucerne that should take place will probably make that commodity available at a price that will come within the reach of poultry-farmers. Since up to 25 per cent. of lucerne chaff (if good) may be used in the morning mash, this factor in itself ought to relieve the situation somewhat.

A hint, however, might be here thrown out in regard to the methods in vogue with many poultry-keepers in respect of the purchase and conservation of supplies. In times of scarcity of pollard and bran such as we have been passing through, a little forethought might go a long way towards relieving a tense situation. For instance, some poultry-farmers have weathered through the bad time by (*a*) ordering supplies well ahead of requirements, and (*b*) conserving their bran and pollard as much as possible, and using a portion of wheat-meal to eke out these lines. As a contrast to this, a large proportion of poultry-keepers use up their pollard and bran as long as these are obtainable, and failing to order sufficiently well ahead, the supply becomes exhausted, and wheat-meal alone has to be used to ensure the birds getting a morning mash at all. Such violent changes are, of course, disastrous to egg production.

A Lesson to be Learned.

It is, of course, understood that many poultry farms are so situated that the growing of lucerne is more or less impracticable; but the great bulk of poultry farming is carried on where the growing of a plot of lucerne is not only practicable, but comparatively easy. Many farms have become an object-lesson in this respect, being situated on ground that would be regarded as totally unsuitable for lucerne growing, but with the aid of water and the manure from the poultry, that disability has been overcome. The value of such lucerne plots has not been sufficiently appreciated by many poultry-keepers who possess the necessary facilities. It is strongly urged that poultry-farmers give more attention to this matter, as it would certainly make their farms more profitable.

Sowing and Cultivation of Lucerne.

Provided a clean piece of land is available, lucerne might be sown on the coast during April and May with success. Should, however, the land require cleaning, sowing should be deferred until spring. When the land has been thoroughly prepared and brought to a fine tilth it may be rolled, then a light harrow run over it, the seed sown, then lightly harrowed in and rolled again. 2 lb. of seed will be sufficient to sow a quarter of an acre broadcast, but if sown in drills less will be required, according to the distance apart of the drills; 14 to 18 inches is a good width, as this will enable a small hand cultivator to be run between the rows. This is decidedly the best method on heavy soils of shallow depth, and particularly where couch grass and weeds have to be contended with.

A Cover Crop.

Whatever the practice may be with large areas, where perhaps the land is free of weed seeds, it is usually advisable on a poultry farm, where the ground is as a rule full of such seeds, to put in what is known as a cover crop for lucerne. This consists of sowing a crop of oats, wheat, or barley first (for use as green feed), then sow the lucerne seed and roll down as above. When using these cereals as a cover crop for lucerne, sow only about one half of the usual quantity of seed.

The idea of the cover crop is to keep down weeds while the lucerne seed gets a start, as it takes longer to germinate and get established than most weeds. The cover crop does not interfere with the lucerne to any extent (provided water is applied as needed), and protects the young lucerne plants; and by the time the cover crop is taken off, the lucerne plants have become established.

After all, the method of growing lucerne is simple, and even rather poor land can be made to yield sufficient for a poultry farm by the use of poultry droppings as a top dressing. Poultry manure, however, should not be dug into the ground. It goes without saying that to ensure lucerne at all times, a plentiful supply of water is necessary, the greatest success being attained where some system of sprinklers can be brought into use. It is surprising the amount of lucerne that can be taken off a few roods of land treated in this way.

Preparations for the Breeding Season.

No time should now be lost in making up the breeding pens and arranging for any new stock it is intended to introduce. By purchasing early, one has the best chance of procuring early-hatched birds which, of course, other things being equal, are the best young stock to breed from.

Perhaps a word regarding the necessity for the introduction of new blood will be opportune, and a note of warning must be sounded against the practice now so prevalent of too close breeding. It, of course, goes without saying that the greatest care should be exercised in selecting the class of stock to introduce into a flock of good birds, and also that it is often advisable, when one has a good flock, to inbreed to some extent in order to keep a preponderance of the home blood.

At the present time there are two circumstances operating that are sapping the very foundations of profitable utility poultry keeping; these are, too close breeding and faulty rearing. Degeneracy takes place through the former, while the latter accentuates the trouble owing to the poor development secured. These factors are operating to such an extent that they are causing more failures than all the other troubles of the poultry farmer, including the feed difficulty.

There are but few flocks in the State but would benefit largely from an out-cross from suitable birds of other strains. By an out-cross is meant the crossing of different strains of the same breed. But here again another difficulty is encountered; new blood is sought for, and not infrequently is obtained from farms where in-and-in-breeding has been carried to the extreme limit. The result is that the out-cross has not been satisfactory, and even may have proved disastrous from the fact of degenerate birds having been introduced; such cases are frequently coming under notice. The necessity for insisting upon good physique in all purchased stud stock is here indicated.

It is quite understood that these statements will prove to some extent bewildering to the novice who is seeking to improve his flock; but to be forewarned is to be forearmed. The sooner this insensate craze for inbreeding utility birds by those not conversant with sound principles of breeding and the type and character of the birds to be bred, the better for the stability of the industry. The notion that inheritance is the sole factor in production is fallacious. Vigour, stamina, and proper development have been proved to be equally important.

ORCHARD NURSERY WORK: BUDDING AND GRAFTING.

THE fourth edition of Farmers' Bulletin, No. 63, by Mr. W. J. Allen, Fruit Expert, has just been issued, and may be obtained by residents of the State engaged in rural industry free on application to the Under Secretary and Director, Department of Agriculture, Sydney.

Agricultural Bureau of New South Wales.

Suggested Subjects for Bureau Meetings.

It sometimes happens that, owing to some inadvertence, or perhaps the failure of the writer of a promised paper, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion :—

Do you practise selection of maize for seed purposes? What characters do you look for as indicating to you good yielding habit? Have you attempted to vary the strain you are chiefly growing, so as to get earlier or later maturing habit as your climatic and soil conditions render desirable? What success have you had?

Having regard to the greater value of crossbred sheep for mutton purposes, have you considered whether crossbreds would pay better on your farm than Merinos? If so, what longwool do you prefer—Lincoln, Leicester, Border Leicester, or Romney Marsh? The lamb market is proving profitable to those who are catering for it. Would it pay you to keep only first-cross longwool ewes, and to mate with them rams of the early maturing Down breeds for the local and export lamb market?

What method do you adopt in selecting your seed potatoes? The small tubers in the bulk, after digging, may be (1) the small potatoes of productive plants, or (2) the average tubers of run-out plants. The former are desirable as seed; the latter not so. Do you employ any means of avoiding the undesirable ones, and what are they?

Have you considered the subject of co-operation, especially in relation to the marketing of crops? Admitting that the higher grades sell themselves, do you think co-operative effort would result in better returns for the lower grades? Have you made any attempt to sell the whole output, say of canning peaches, to canning factories direct by the ton, instead of marketing through the ordinary channels?

At what ages do you usually mate heifers in your herd? Do you consider it any advantage to delay mating in order to permit of greater development? Is there any advantage as to development in allowing a longer interval than usual between the first and second calf? What class of fodder do you provide for the springing heifer to ensure that she has a good start when she comes to profit?

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Batlow.

On 19th December Mr. J. F. Moody, Assistant Fruit Expert, gave a very interesting demonstration on summer pruning, and in the evening a lantern lecture treating on fruit-growing in general. The summer pruning was conducted in two orchards, and included young and old trees. The orchards were the same as those in which Mr. Moody conducted a winter pruning demonstration some months before, so that growers were able to follow up the effects of the earlier work.

Mr. W. B. Gurney, Assistant Entomologist, visited Batlow on 5th and 6th February, and gave a lecture in connection with the destruction of grasshopper swarms in the Batlow district. At the request of Mr. A. C. Arnot, Hon. Secretary, Mr. Gurney's report is published for the information of readers who are interested in the subject. It was in the following terms:—

DESTRUCTION OF GRASSHOPPER SWARMS.

The fruit-growers of the district regretted that they had not notified the Department earlier, as from the date of their first communication the grasshopper pest began to abate, and there was scarcely any damage being done when I arrived. However, enough was seen to show that the visitation had been very severe. The foliage of apple, pear, and plum trees was riddled by the swarms, and twigs sometimes denuded, while where the hoppers had been thick, from 1 per cent. to 5 per cent. of the fruit on a tree had been eaten so as to be quite unmarketable. The bark of shoots and young trees was also sometimes gnawed off. Specimens were collected and photographs made as a record of this rather unique infestation.

I found species responsible for the bulk of the damage. Present in far the greatest numbers was *Azolota*, a small brown species common enough along our coastal and tableland districts, but not recorded before as appearing in swarms to a destructive extent. Both in the wingless younger stages and in the adult winged stage, they climbed up the trees to the topmost twigs and fed on fruit and leaves. Associated with this species was another small brown species (not nearly so plentiful), with yellow laterodorsal stripes, which also attacked the fruit trees; while a third species that apparently confined itself to grass and weeds was the yellow-winged grasshopper (*Gastromargus musicus*), sometimes recorded as destructive to vines. Outside the orchards, on grass, I found the smaller plague locust (*Chortoicetes pusilla*) in minor numbers; while of the usual plague locust (*Chortoicetes terminifera*), so commonly destructive in our central and western districts, and recently swarming in the Muswellbrook and Scone districts, no trace was visible in or out of the orchards which I visited. This infestation is therefore probably an unusual one, being fostered by the dry conditions which favour grasshoppers. The fruit trees probably formed the most succulent vegetation to hand.

Control.—I feel sure such infestations can be controlled, and perhaps the best method for this local attack, should a second swarm of hoppers hatch out in a week or two, would be the use of bran and Paris green mash scattered in front of the line of advance of swarms moving towards or across an orchard. The arsenite of soda spray, as recommended for large and widespread swarms throughout large areas (in the *Agricultural Gazette* for February) could be employed also, but probably the use of bran baits, if bran is obtainable, would prove the handiest for orchardists. The bait is made as follows:—

(*a*) 2½ lb. Paris green (if not obtainable, use white arsenic) mixed dry with 50 lb. of bran; (*b*) prepare a liquid of six lemons chopped up fine, rind and all, 4 quarts of treacle, 5 gallons of water. Then mix (*a*) and (*b*) to make a wet mash.

Spread this broadcast by hand, scattering the bait as a crumbly mash, *not* in lumpy pellets, as it is less dangerous to poultry when finely scattered. A broad strip in front of the line of advance of the hoppers and about the base of trees or infested grass will attract the hoppers even from their natural green feed. The bait is most attractive when moist. The first hours of morning, say 5 a.m. to 7 a.m., is by far the best time to distribute the bait, as it has not been drying overnight, nor has the sun been shining on it. Unlike cutworms, which feed at night, the grasshoppers feed from the early morning on. About 5 lb. only to the acre has been found effective if scattered judiciously, and is economical of material. Large pellets soon dry on the outside, and are unattractive and wasteful of much material. In America it has been demonstrated that the plain bran and Paris green is effective, but lemons add much to the attractiveness to grasshoppers, even more so than oranges or any other substance tried.

Bimbaya.

At the monthly meeting of this branch, the subject discussed was the suitability of the natural pastures of the district for dairying purposes. The subject, which was suggested in the questions in the *Agricultural Gazette* for December, proved most interesting, and the discussion was quite lengthy. The following is a summary :—

NATURAL PASTURES.

Mr. J. **BRITTEN** thought that the natural pastures were not all that could be desired. Enormous damage had been done by the rabbit pest, many of our best grasses having almost died out. He advocated the sowing of artificial grasses, and instanced a farm where that had been done, the result being a much greater carrying capacity and increased milk yield.

Mr. A. **JONES** considered that the natural pastures could stand a lot of improvement. They were unsuitable for carrying on dairying successfully all the year round. The district was rather too dry for the successful growth of certain artificial grasses, such as rye and cocksfoot, which required a considerable amount of moisture. He favoured the growing of maize to provide fodder during the dry summer months.

Mr. T. **HEFFERNAN** said that in his opinion the natural pastures required to be supplemented by artificial grasses and fodders. Prairie grass provided good feed in the early spring when other grasses were backward. He advocated the establishment of an experimental grass plot by the Department of Agriculture in a suitable part of the district. Much seed had been wasted by inexperienced persons in the past.

Mr. J. H. **ALCOCK** thought that the natural pastures in themselves were insufficient for successful dairying. Artificial grasses soon died out, with a few exceptions. He regarded lucerne as the best standby in times of drought. From a small plot in his place he had taken 20 tons of lucerne hay in twelve months. He also strongly favoured the establishment of an experimental plot in the district.

Mr. E. T. **BOLLER** considered that with careful management the natural pastures could be much improved. He was entirely opposed to the burning-off methods adopted by many farmers. Besides drying the ground it destroyed a vast amount of material which would in a short time be turned into humus and plant food. Much natural grass was allowed to go to waste in good seasons. He believed that if cut when on the green side, it could be made into very palatable hay. He had been informed that cows milked better off lucerne hay than when fed on green lucerne.

Mr. F. **HEFFERNAN** thought that a great deal of damage had been done to pastures by rabbits. Overstocking was also harmful. He advocated smaller paddocks, so that the grass could be allowed to seed when required. The pastures could thus be much improved. He considered that the practice of sowing artificial grass seed among the natural grasses was a failure, as stock pulled most of it out before it had taken proper root.

Mr. A. J. **ALCOCK** was not in favour of burning off pastures. Besides burning much valuable manure, &c., a vast amount of seed was also destroyed. He thought that overstocking was not so harmful as burning off. The natural grasses would hold their own against artificial grasses, being much hardier. Local farmers did not put enough lime on their soils. He was a great believer in liming the soils. In some parts of America it was customary to apply 18 cwt. of lime to the acre. We should build more silos. In one State alone in America there were 10,000 silos.

Mr. H. J. **GREALY** said that he preferred the natural grasses. They were superior to the artificial grasses ; cows yielded better when fed on the natural grasses. Cocksfoot would not stand dry weather. Lucerne was a good crop, but required a fairly rich soil.

Mr. G. **ALCOCK** thought that artificial grasses were necessary to supplement th natural grasses. With the disappearance of the rabbits the natural grasses would com again. He gave as an illustration the splendid growth of clover during the last two seasons on land where the rabbits had been cleared out. This was noticeable even on hilly land. Prairie was a valuable grass, as it came in the early spring, before most of the natural grasses had made a start. He thought that what had been done in America could also be done in Australia. When the rabbits were got rid of, farmers would have more time to devote to the improvement of their pastures and farms. He was strongly in favour of liming, but the cost of getting lime from Sydney was excessive. He believed there were extensive limestone deposits on Monaro, and something should be done to make it available to farmers.

Cardiff.

The usual monthly meeting of this branch was held on 8th February, when there was a large attendance. The subject for discussion was tomatoes. The pamphlets which were forwarded by the Department were greatly appreciated by members and formed a basis for the keen discussion that followed.

Earliana, Atlantic Prize, Chalk's Early Jewel, Money-maker, Matchless, Burwood Prize, Market Champion, Rapid Red, and Perfect, were all discussed in turn. After putting a vote to the meeting, the following varieties were chosen as the best and most suitable to grow in this district:—

Early marketing varieties—Rapid Red, Earliana, and Atlantic Prize.

Late marketing varieties—Matchless and Earliana.

It was the opinion of members that it was useless trying to grow for the mid-season, as failure had followed each attempt. Burwood Prize was said to be too small to grow, though some members held that it was a large tomato. It was conceded on all sides that Spark's Earliana was quite the best for the district, and was a sure cropper and a good-looking fruit. Atlantic Prize was found to be earlier than Earliana, but it was ugly and ribbed ; buyers preferred a round smooth fruit. The highest price obtained for tomatoes this season was £1 for half-bushel case, whilst one grower obtained £100 from 1,000 plants at 10s. per case. Last year from 1,500 plants £170 was taken at 15s. per half-bushel case. In each case Earliana was the variety. It was suggested that tomatoes should follow peas. The north-east or north-west was found to be the best aspect.

Cordeaux-Goondarin.

A well-attended meeting was held on 15th January, when the following paper on pumpkin growing was read by Mr. Roy Fishlock, a young member of the branch, who has been very successful in that direction.

PUMPKIN GROWING.

The ground must be worked well so as to get it very fine. The first ploughing should be done in the beginning of the winter, and the next ploughing about the last week of September, and planting should be done when all danger from frosts is over. Holes should be dug about 18 inches or 2 feet square and 8 inches deep. Then place in the hole about 10 or 15 lb. of farmyard manure and ½ lb. of superphosphate. The manure and superphosphate should then be mixed, and covered with soil to the level of the surface. Place five seeds in the hole, one in each corner and one in the centre, and then cover to the depth of about 1 inch with the remaining soil. Holes should be about 10 or 12 feet apart ; if planted at that distance all the ground will be covered when the vines are full grown. The best variety is Crown, which grows to about 30 lb., and is a good selling variety. The Button pumpkins are of a smaller class, which grow to about 10 lb. Pumpkins do not need a very heavy rainfall. If the ground is worked well a good crop can be grown with a rainfall of 5½ inches. Ground that has been worked well has produced a very fair crop with a rainfall of 3·7 inches for the first three months. The main vines grow to about 20 feet or more in length, and have many short vines coming off them ; these last have the most fruit on them. Along the main vines there are a number of small feeder roots which come out at about each leaf. They grow to about 3 inches in length. The seed should always be saved from the best of the fruit.

DEPARTMENTAL NOTE.—The Chief Inspector of Agriculture states that between the first and second ploughing, the surface of the soil should be kept in good tilth by using the cultivator and heavy harrows, as when rain falls on ploughed ground the surface becomes compact and moisture is lost by evaporation. The cultivation prevents this loss, and also destroys weeds, which exhaust the soil fertility and also the supplies of moisture. When the soil is opened to receive the seed, it should be well pressed down about the seed to make it firm, and then the covering soil should be compacted by hand, and finally soil sprinkled over the surface. The compacted soil around the seed leads to germination, and the loose covering over all prevents the undue evaporation that a compact top surface would set up.

Lisarow.

This branch met on 10th February, when Mr. O. Brooks, Fruit Inspector, gave an interesting address on spraying.

SEASONABLE SPRAYING.

Detailed instructions were given for the making of various sprays for citrus trees, particularly prepared red oils, either alone or in combination with washing soda for the control of Indian wax scale. As a good spray for citrus trees the following was strongly recommended, viz., 6 lb. caustic soda, 16 lb. resin, 3 pints fish oil, 100 gallons water. This should be applied hot. The drawback to this spray is that a large boiler or copper is required—an article not always found on small orchards.

DEPARTMENTAL NOTE.—The Fruit Expert remarks that this spray is usually made up as a stock solution with 20 gallons of water, and the balance of the water is added subsequently at the rate of 4 gallons hot water to 1 gallon of the stock solution. In this case a 100-gallon boiler is not necessary for mixing. In small orchards a supply of hot water can be kept up by using a 40-gallon iron boiler, which can also be used for making lime-sulphur solution, or a washing copper, or three or four carbide drums can be made to serve the purpose.

Lower Portland.

A meeting of members was held on 4th February, and was well attended. A discussion took place in connection with the best varieties of summer fruits to grow, and much valuable information was given by members.

Miller's Forest.

At a meeting of this branch on 10th March, a discussion took place on an increased yield of millet that followed the use of nitrate of soda.

Mr. C. Cunningham read a paper on calf rearing, of which a summary follows:—

CALF REARING.

With the increasing demand for milk and the high prices of cattle, calves are proving a most valuable asset to the dairy farmer. The present system of handling the milk and cream in the district is most convenient, and much more profitable than separating on the farm. It also does away with a great deal of labour, but leaves the dairyman minus his skim milk, so that he is faced with the problem of rearing his calves on some other food that is equally beneficial.

From the experience of the big dairymen it has been proved that the best calves are left on the mothers for at least a day and a half or longer, according to the health of the calf, and when taken off they should be left for twenty-four hours before being fed. The calf thus becomes hungry, and is much more easily taught to drink without the finger. About a quart of milk is sufficient for the first feeding. The most effective way of teaching the calf to drink is to stand straddle legs over him, keeping him against a wall or fence. Insert a finger of the left hand into the calf's mouth, at the same time pouring a little milk into the mouth with the other hand until he begins to suck vigorously. Then gently lower the head into the milk, with the finger still in the mouth, and when the calf is well started slowly draw the finger away. With a little patience the calf will, in nearly all cases, be taught to drink at the first feeding. The calf should be given his natural food for at least four days, as that helps to produce a better constitution and greater immunity from scours.

Calves are stunted by being fed in large quantities only twice a day. The natural way to feed calves is to give a little often, and certainly not less than three times a day. The bucket or pail should be kept clean, and the calf should be made to drink slowly. It is also important where calves are running together to wipe their noses after feeding to prevent them from sucking each other. There are many kinds of diseases from which calves suffer. The worst is white scours. All animals suffering from it should be isolated; but the best treatment is to prevent it by ensuring clean conditions in every possible way.

Cracked maize is proving an excellent ration, but must not be given till after fourteen days, and it should be boiled, about half a baking powder tin twice daily; fed in this way it will be found to be cheaper than most of the foods. The calf must not be allowed to eat grass for six weeks, but may be given a little hay after a fortnight, and must not be given any water for the same period.

Spencer.

On 22nd February a meeting was held, when a paper was read by Mr. A. M. Woodbury on irrigation in New South Wales, summarising what he considered were the principal reasons for failure. The paper provoked an interesting discussion.

Stratford.

A meeting was held on 17th February. General business having been transacted, there followed a discussion on pasture grasses. Most of the members agreed that paspalum was the best all-round grass for the district, owing to its drought-resistant qualities and its richness for cream production.

Wolseley Park.

The annual meeting was held on 7th December last, when the following office-bearers were elected:—Chairman, Mr. M. T. P. McAuliffe; Vice-Chairmen, Messrs. J. Downie and A. J. Sheehan; Treasurer, Mr. A. C. Evans; Hon. Secretary, Mr. L. M. Evans.

Woonona.

A meeting was held on 11th February, when three new members joined the branch. A sub-committee was appointed for the purpose of drawing up a schedule for a chrysanthemum show, which is to be held on 26th April next. The chief item will be a competition between eighteen members as to who can produce the best chrysanthemum bloom from plants supplied gratuitously by the Vice-Chairman of the branch (Mr. E. Perkins).

Yarramalong.

A lecture was given by Mr. C. Pedersen, Dairy Instructor, before this branch on 31st January.

Mr. Pedersen opened by saying that the time was not far distant when type would be but a secondary consideration in the selection of dairy cattle. Cows would then be judged by results, which, looked at from a common-sense point of view, was the correct method. He asked if herd-testing had ever been practised in the district, and strongly urged farmers to endeavour to give it a trial, as the majority of cattle he had seen during his journeys in the district had not greatly impressed him. He felt sure that systematic herd-testing would do much towards uplifting the industry. The lecturer favoured either Jerseys or Milking Shorthorns, it being easier to get good sires from time to time than from the other breeds.

Questions were asked after the lecture as to the efficiency or otherwise of milking machines. Mr. Pedereen stated that in the hands of a capable and clean user no bad results were known to follow the use of the machines. In calf feeding he advised three feeds per day in place of the two usually given, as much of the future sturdiness of the stock depended on care during the first few months of their growth. Tuberculosis was not hereditary, as diseased mothers had often given birth to perfectly healthy calves as far as that disease was concerned, although the calf would be affected constitutionally by the diseased state of the dam or sire as the case might be.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	A. Buchhorn, Albury.
Baan Baa	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bankstown	J. W. Cunningham, Brancourt avenue, Bankstown.
Bathurst	J. McIntyre, Orton Park.
Batlow	A. C. Arnot, Batlow.
Beckom	H. Horsburg, Beckom.
Bimbaya	J. B. Boller, Tantawanglo.
Blacktown	B. H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell).	C. A. McAlister, Bloom Hill, O'Connell.
Bobin	Chas. Pfeiffer, P.O., Marlee, via Wingham
Borambil	H. A. D. Crossman, "Homewood," Quirindi.
Braidwood	A. Page, Braidwood.
Brocklesby	J. Hunter, Brocklesby.
Buckaroo	P. J. Crowley, Buckaroo.
Bungalong	G. H. Pereira, Grenfell Rd., via Cowra.
Canadian	F. W. Taylor, Canadian Lead.
Cardiff	John Cockburn, Cardiff.
Carlingford	F. H. Harvey, Ray Road, Epping.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Clovass	W. G. Cox, Tatham.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Bowcliff, Cow Plain, Collie.
Comboyne	J. J. Dolton, Comboyne.
Coonabarabran	H. H. Moss, Coonabarabran.
Coradgery	M. J. Kelk, Black Trundle Road, Parkes.
Coraki	G. A. Forrest, Coraki.
Cordeaux-Goondarin.	G. H. Walker, Upper Crown street, Wollongong.
Coreen-Burraja	—
Corowa	R. Dwyer, Corowa.
Cotta Walla	T. A. Howard, Cotta Walla, Crookwell.
Crudine	F. W. Clarke, Crudine.
Cumnock	K. J. Abernethy, Cumnock.
Cundletown	S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla.	J. D. Berney, Eurimbla, via Cumnock.
Cunningham	B. J. Stocks, Linden Hills, P.O., Cunningham.
Deniliquin	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	Geo. Turvey, Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook	W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	W. Thompson, Forest Ck., Frogmore
Garra & Pinecliff	S. W. Packham, "Clifton," Pinecliff.
Gerringong	J. Miller, Warrabank, Toolijooa.
Glenorie	J. Hutchinson, Cattai Rd., Glenorie.
Grenfell	A. A. Patterson (*pro tem.*), Grenfell.
Gunning	E. H. Turner, Gunning.
Hay	F. Headon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
Hillston	M. Knechtli, Hillston.
Holbrook	Frank F. Forster, Holbrook.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jilliby-Dooralong	K. A. Smith, Jilliby, Wyong.
Jindabyne	Sylvester Kennedy, Jindabyne.
Keepit (Manilla)	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	J. M. Firth, Kellyville.
Kyogle	J. Martin, Kyogle.
Leech's Gully	James Donnelly, Leech's Gully.
Leeton	W. J. Monfries, Farm 521, Leeton.
Lidcombe	H. Laman, Martin-st., Lidcombe.
Lisarow	A. L. Kelman, Lisarow.
Little Plain	F. S. Stening, Little Plain, via Inverell.
Lower Portland	W. C. Gambrill, Lower Portland.
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.

Branch.	Hon. Sec.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham	A. E. Caldwell, Erina.
Meadow Flat	T. L Williams, Meadow Flat, via Rydal.
Middle Dural	A. F. Best, "Elliceleigh," Dural.
Milbrulong	F. W. Gollasch (*pro tem.*), Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Miranda	A. C. Wigzell, Sutherland.
Mittagong	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya.
Moss Vale	W. G. Bale, Moss Vale.
Narellan	G. J. Richardson, Narellan.
Narrandera	James Faulkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains.
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville	C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith).	K. Basedow, Orchard Hills, via Penrith.
Parkesbourne	S. W. McAlister, Parkesbourne.
Peak Hill	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	L. S. Pieremont, Penrose.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue)	E. Miskle, P.O., Lue.
Quaker's Hill	C. Gardner, Blacktown.
Rawsonville	G. R. J. Hovenden, Rawsonville.
Redbank	J. J. Cunningham, Redbank, Laggan
Ringwood	Wm. Tait, Ringwood.
Robert's Creek	J. W. Morrissey, Robert's Creek.
St. Marys	W. Morris, Queen-st., St. Marys.
Sackville	Arthur Manning, Sackville.
Sherwood	J. E. Davis, Sherwood.
Speedwell (W. Wyalong).	B. Noonan, Speedwell, W Wyalong.
Spencer	H J. Woodbury, Spencer.
Springside (via Orange).	E. H. Selwood, Springside.
Stockinbingal	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Stratford	P. H. Deards, "Loch Maree," Stratford.
Tallawang	Selwyn E. Hinder, Tallawang.
Tallong	W. Snushall, Tallong.
Tangmangaroo	A. Thompson, Kangiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, "Chacewater," Chellington, Temora.
Tennyson (North Richmond).	H. C. Croft, Kurrajong.
Thyra-Bunaloo	C. H. M. Smith (*pro tem.*), Thyra, via Moama.
Tingha	M. L. Levitt, Tingha.
Toronto	J. Froome, Knowle Farm, Toronto.
Ulan	P. S. D. Howarth, Ulan, near Mudgee.
United Peel Riv. (Woolomin).	C. J. MacRae, Woolomin.
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	E. Crouch, "Estella," Wagga.
Walla Walla	H. Smith, Walla Walla.
Wallendbeen	W. J. Cartright, Wallendbeen.
Walli	C. T. Allen, Walli.
Warner's Bay and District.	J. Raw, Fairfax-st., Spiers' Point.
Wellington	L. Jurd, Warne-st., Wellington.
Wetherill Park	A. J. Hedges, Wetherill Park.
Windsor	W. H. Spinks, Windsor.
Wollun	J. B. Anderson, Wollun.
Wolseley Park	L. M. Evans, Wolseley Park.
Woonona	H. Coltman, Woonona
Wyan	—
Wyong	Edgar J. Johns, Wyong.
Yarramalong	E. Hodges, Yarramalong.
Yetholme	—
Yurrunga and Avoca.	F. Saville, Yurrunga.

Orchard Notes.

APRIL.

W. J. ALLEN.

Harvesting.

THE busiest time for the apple and pear grower will be over towards the end of this month. Harvesting operations will be confined to the later apples and pears, such as Granny Smith, Yates, Packham's Triumph, Josephine de Malines, &c. It seems probable that prices will remain attractive enough for growers to put these late varieties direct on the market, but should any wish to keep this late fruit, either in cool or ordinary store, the following points should be observed:—The fruit should be picked when cool, and kept cool; do not allow the picking boxes to stand in the sun before or whilst in transit to the stores; the fruit must be carefully sorted, and only those which are free from bruises or other damage retained for storing; if the fruit has to travel any distance to the store, it should be wrapped and packed before transit, but if the store is at the orchard the fruit can be placed in paper-lined cases.

Though wrapping is an aid to keeping, these late varieties keep in good condition in well-lined cases; moreover, the fruit can be more easily examined whilst in store, and can be wrapped and packed when withdrawn from the store for sale.

Cover Crops.

Though these should have been sown as directed last month in order to secure as heavy a growth as possible before it is time to plough it under, a very fair growth under favourable circumstances should be obtained if the seed is sown at once.

Manuring and Liming.

This is a good time (if the ground is dry enough) to cart on any farmyard manure, bush scrapings, or new soil. The autumn is also a suitable season for applying lime to soil that requires it.

Planting.

In districts free from frosts the citrus trees can still be planted out if the soil is in good condition (neither too dry nor wet). All such trees, as well as any that have been planted within the last three seasons, should be protected by bushes or other covering before the winter frosts come on.

Clearing.

Clearing can proceed for fresh plantings of deciduous trees in the winter or citrus trees in the spring; but as pointed out last month, it is better to complete this earlier so that the land can be ploughed and left in condition

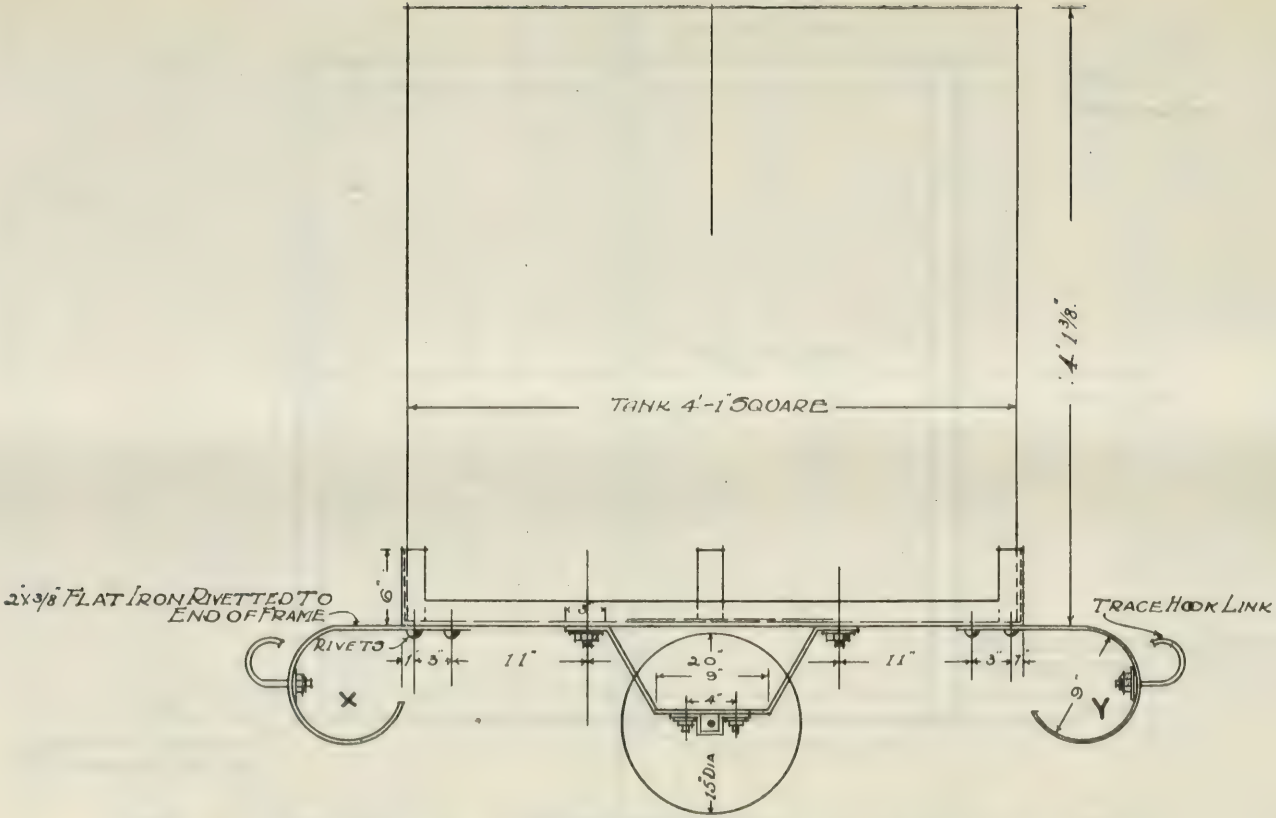

Fig. 1.—Elevation of Orchard Burner, showing dimensions of carriage frame.

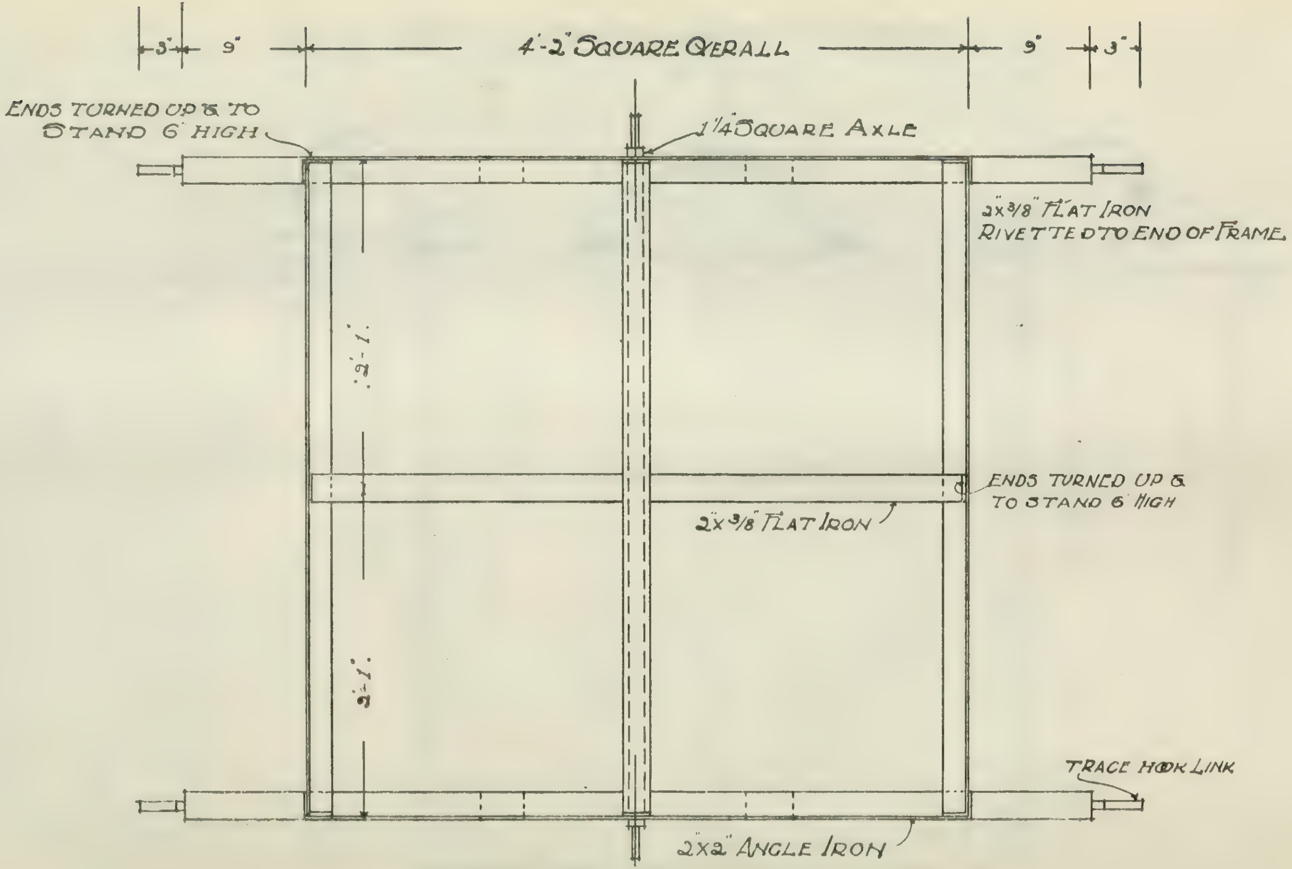
3"
9"
4'-2" SQUARE OVERALL
9"
3"
ENDS TURNED UP & TO STAND 6" HIGH
1¼" SQUARE AXLE
2"x3/8" FLAT IRON RIVETTED TO END OF FRAME
2'-1"
2'-1"
ENDS TURNED UP & TO STAND 6" HIGH
2"x3/8" FLAT IRON
TRACE HOOK LINK
2"x2" ANGLE IRON

Fig. 2.—Plan of Framework of Orchard Burner.

to sweeten and retain any early rains that fall. Likewise any land already cleared and not ploughed or subsoiled should be prepared as soon as possible. Order for necessary young trees should be sent in without delay. Varieties should be worked on the stocks most suitable to them and the districts they are being planted in. Apples should be on woolly aphis-proof stock. In planting refills amongst older trees, the young tree will make more satisfactory headway if a large hole is dug out and a load of new soil in which to plant it tipped in.

Spraying.

There is still time to spray or fumigate citrus trees infested with scale this month. Where the young scale is much advanced such good results will not be obtained as from earlier spraying, but it will be better than neglecting it altogether. Where woolly aphis has made headway during the busy part of the season the trees should be sprayed with a tobacco wash as soon as the fruit is cleared from the trees.

Cultivation.

Where no cover crop is to be sown land can be ploughed, then left in the furrows for the winter months.

Cross-Pollination of Pear Trees.

The following information on this subject, furnished by Mr. Sim, Capertee, is interesting :—Contrary to the general experience Mr. Sim has found that Kieffer pears crop with him without cross-pollination. He packed well over 1,750 bushels of Kieffer pears from 350 trees in one block, alongside of Williams pears. He cannot see any difference in the set of the trees adjoining the latter variety as compared with those farthest away.

A Handy Orchard Burner.

The attached diagrams show the construction of an undercarriage for carrying an old square tank which is converted into a burner for disposing of prunings. The tank should have the top cut out, but in doing this a piece should be left at each corner to act as a stay. The bottom should be liberally punched with 1 inch or 1½ inch holes.

In some places the wheels are dispensed with. The pieces marked X and Y in Fig. 1 are not then turned up as shown in the diagram, but are connected with one another by a steel bar which acts as a runner on a sled.

Some foundries in Victoria manufacture orchard burners ; these are generally made longer than the converted tank burner, and the sides are wide at the top narrowing towards the base. However, we have found the converted tank quite satisfactory.

Orchard burners are also very useful in burning off roots, &c., after ploughing a newly-cleared paddock.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1919.

Society.	Secretary.	Date.
Central Cumberland A. and H. Assocn. (Castle Hill)	H. A. Best	Date to be fixed.
Cootamundra A., P., H., and I. Association	N. Gardner	,,
Batlow A. Society	C. S. Gregory	April 8, 9
Blayney A. and P. Association	H. R. Woolley	,, 9
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	Abandoned.
Queanbeyan P. and A. Association	J. G. Harris	May 6, 7
Cobargo A., P., and H. Society	T. F. Kennelly	,, 7, 8
Clarence P. and A. Society (Grafton)	G. N. Small	,, 7, 8
Upper Manning A. and H. Association (Wingham)	D. Stewart	,, 7, 8
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 14, 15, 16
Newcastle A., H., and I. Association	E. J. Dann	,, 14, 15, 16, 17
Dungog A. and H. Association	W. H. Green	,, 21, 22, 23
Moree P. and A. Society	A. U. Ezzy	,, 21, 22, 23
Richmond River A., H., and P. Society (Casino)	———	,, 28, 29
Parkes P., A., and H. Association	G. W. Seaborn	Aug. 20, 21
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 26 27, 28
Corowa P., A., and H. Society	J. D. Fraser	Sept. 2, 3
Albury and Border P., A, and H. Society	F. J. Belbridge	,, 9, 10, 11
Young P. and A. Association	T. A. Tester	,, 9, 10, 12
Manildra P. and A. Association	A. Anderson	,, 10
Northern A. Association (Singleton)	J. T. McMahon	,, 10, 11, 12
Culcairn P., A., H., and I. Society	J. B. Ryan	,, 16, 17
Ganmain A. and P. Association	T. S. Henderson	,, 16, 17
Temora P., A., H., and I. Association	A. W. Ness	,, 16, 17, 18

1920.

Southern New England P. and A. Association (Uralla)	H. W. Vincent	Feb. 24, 25, 26

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1919.

*54243—b

AVIATION

New South Wales School of Aviation, Richmond.

Hitherto the facilities of the New South Wales School of Aviation at Richmond have been utilised solely for the training of Pilots for war purposes. The need for these has passed with the suspension of hostilities. It has now become possible to train men who are interested in Aviation privately or wish to engage in it commercially. It has, therefore, been decided that for the future the Aviation School shall be carried on as a branch school of the Technical Education Department, providing two separate courses of instruction—one for Pilots and the other for Mechanics.

The course of training for Pilots will cover a period of not more than 13 weeks, and students will receive practical instruction in flying, the principles of aviation, and practical instruction in adjustments.

The Mechanics' course has been specially designed for those who are gaining experience in one or other of the various trades connected with engineering or wood-working, and who wish to become aviation mechanics. These students will be given instruction in the adjustment and maintenance of aeroplanes, and will have special instruction in engine work and rigging.

The Mechanics' course will be carried on so as to enable students to get the instruction by either attending on two week afternoons or for a full day on Saturdays, the latter provision being intended to meet the special case of apprentices who can get off from their work on Saturday mornings. The latter course will commence at 10.45 a.m. and will last till 5 p.m, and the afternoon courses will be from 2.30 to 6 p.m. in Summer and 2.30 to 5 p.m. in the Winter. All these times have been made to suit Railway time-tables.

Persons desirous of availing themselves of either of these courses of instruction should apply to the Registrar, Technical College, Ultimo, where full particulars as to fees, etc., may be obtained.

JAMES NANGLE,
Superintendent of Technical Education.

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2nd May, 1919.

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Farmers' Experiment Plots.

WHEAT AND OAT EXPERIMENTS, 1918–19.

Riverina and South-Western Slopes.

H. C. STENING, Inspector of Agriculture.*

WHEAT experiments were conducted during the 1918 season in fifteen different districts throughout the Riverina and South-western Slopes. The following are the names and addresses of the wheat-growers who undertook to carry out the experiments on their farms in co-operation with the Department:—

W. Belling, "Pine Grove," Lockhart.
M. J. Carew, "Selbourne," Deniliquin.
W. Cruickshank, "Eurowie," Marsden.
R. O. Eulenstein, "Gracevale," Henty.
D. and J. Gagie, "Spy Hill," West Wyalong.
H. P. Gaffney, "Glenhope," Oaklands.
E. W. L. Gordon, "Yanterilla," Tubbul.
H. M. Hall and Sons, "Studbrook," Cunningham.
Jennings Bros., "Urunga," Culcairn.
Johns Bros., "Wollongough," Ungarie (R. B. Robb, Manager).
L. E. Kendall, "Mayburn," Holbrook.
A. McDonald, "Bright View," Balldale.
R. G. Thackeray, "Woornack," Young.
W. Thornton, "Spring Farm," Berrigan.
A. A. Wallace, "Allawah," Binya.

Variety and fertiliser experiments were carried out in every locality, and on some farms additional tests were conducted, viz., fallowing, rate of seeding, crop-harrowing, early *v.* late sowing, graded *v.* ungraded seed, and acclimatised *v.* introduced seed. The total number of plots at each centre varied from fourteen to eighteen, each plot being three-quarters of an acre in area.

In order that late and early maturing varieties could be sown seasonably, two sowings were made in all districts excepting three, viz., Deniliquin, Berrigan, and Tubbul.

The Season.

The 1918 wheat season can be regarded as anything but favourable, not so much owing to a low annual rainfall as to a very unequal distribution of the rains that fell throughout the year. In fact, in a few districts, notably those in close proximity to the Murray, the rainfall for the year was appreciably in excess of the average, while north of the Murrumbidgee the year's rainfall was below average; in fact, the farther north the district was located the more accentuated was the deficiency.

---

* Now Manager, Temora Experiment Farm.

Fortunately, heavy rains that fell during the "fallow" period provided a good reserve of moisture in the soil, which enabled the crops to return satisfactory yields in spite of the very poor distribution of the rains during the growing period. An idea of the nature of the rainfall during the period between ploughing and sowing may be obtained by reference to Table I.

TABLE I.—Showing the Rainfall during the Fallow Period, Riverina and South-western Slopes, 1917–18.

Month.	West Wyalong.	Berrigan.	Deniliquin.	Baldale.	Young.	Henty.	Marsden.	Ungarie.
1917.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
August	...	...	...	254	...	...	...	...
September	150	217	204	239	222	...	162	190
October...	334	455	401	358	352	477	94	248
November	463	323	332	360	433	383	385	434
December	86	67	60	86	145	189	80	140
1918.								
January	445	457	382	231	323	130	278	381
February	83	320	106	158	0	232	62	138
March	123	138	131	138	0	196	88	102
April	51	133	106	49	142	65	...	20
May	...	554	374	...	...	...	...	...
Total during fallow period ...	1,735	2,664	2,096	1,873	1,617	1,672	1,149	1,653

The moisture that was conserved in the soil as a result of such a large precipitation during the fallow period was a most potent factor in sustaining the crops over the dry spells during the growing period. January's rainfall in most districts greatly exceeded the average for that month; while the autumn rains did not depart much from the normal, except in districts close to the Victorian border, where heavy rains in the middle of May put a stop to drilling at a most important time in the sowing period. In the districts north of the Murrumbidgee the conditions during the sowing period were ideal, with just sufficient rain to ensure an excellent germination of the seed and keep the young crops growing, but with scarcely a day's stoppage of the drills. In fact, the crops could not have "gone in" better. Mice were plentiful in some districts at sowing time, but they did not destroy the sown seed and young seedlings, as in the previous year; where the harrows followed the drill there were no complaints on this score.

Table II shows the distribution of the rainfall during the growing period at those farms where the records were available.

TABLE II.—Showing the Rainfall during the Growing Period—Riverina and South-western Slopes, 1918.

Month.	West Wyalong.	Berrigan.	Deniliquin.	Balldale.	Young.	Henty.	Tubbul.	Binya.	Marsden.	Ungarie.
1918.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
April	120	...	...	150	...	113	...	...	92	58
May	101	...	...	375	128	230	...	112	80	80
June	104	164	131	189	131	168	62	70	37	131
July	107	191	5	60	151	74	208	25	60	44
August	254	192	172	436	397	394	418	251	177	182
September	66	37	41	81	56	43	129	15	57	60
October	112	0	60	19	71	43	99	51	54	71
November	31	0	0	16	23	4	0	0	15	5
December	...	...	0	...	...	...	...	...	...	...
Total during growing period	895	584	409	1,326	957	1,069	916	524	572	631
Total during growing period of the late-sown crops	674	...	...	758	818	684	...	412	400	493
Average yield of varieties ...	b. lb. 24 36	b. lb. 22 16	b. lb. 22 13	b. lb. 19 48	b. lb. 19 68	b. lb. 17 33	b. lb. 15 25	b. lb. 14 54	b. lb. 11 49	b. lb. 7 49

During June and July, which is usually the rainy season in the portion of the State under review, the precipitation was much below the average, but the deficiency was to some extent compensated for by continuous heavy rains throughout August, which in some districts exceeded 4 inches, and on low-lying situations the crops were threatened to be "drowned." Farmers were now wanting fine weather, and they got it with a vengeance, for practically no serviceable rain fell from the beginning of September to the end of the year. The lack of rain during spring, which is the critical period of the crop's growth, had a most depreciating influence on the ultimate returns, although early in September bumper yields were promised. The sample of grain produced was plump, and as no rains fell during harvest time it was of good quality.

In order to show the relation between rainfall and yield, the average yield of all varieties at each locality is appended to Table II. It will be noted that at Deniliquin an average yield was over 22 bushels per acre, notwithstanding the very low rainfall of a shade over 4 inches during the growing period ; one plot (Canberra) yielded over 29 bushels.

Soil and Cultural Notes.

West Wyalong.—The soil, which was a red sandy loam with clay patches, had produced ten crops previously ; ploughed 4 inches deep at the end of August ; scarified in November and again in February ; disced in March ; early sowing made on a slightly moist seed-bed on 8th April, at the rate of 50 lb. seed and 56 lb. superphosphate per acre ; late sowing made on a wet seed-bed on 8th May, at the rate of 60 lb. seed and 56 lb. superphosphate per acre; harrowed after drilling. The ears of Comeback were slightly "tipped."

Berrigan.—Clay loam, which had been under cultivation for about eighteen years; ploughed 4½ inches early in September; spring-toothed in October; disced after rain in February; spring-toothed prior to sowing; drilled on 28th May on a wet seed-bed, at the rate of 50 lb. seed and 56 lb. superphosphate per acre; harrowed after drilling. The growing crop was harrowed on 18th July. Improved Steinwedel shed its grain badly.

Deniliquin.—Grey to red clay loam, cropped for the first time; ploughed 5 inches at end of August; spring-toothed in January; disced and harrowed at the end of April; spring-toothed and harrowed prior to sowing; drilled on 25th May on a moist seed-bed, at the rate of 55 lb. seed and 56 lb. superphosphate per acre; harrowed after drilling. The growing crop was harrowed on 30th July. The ears of Federation, Major, Warden, and Yandilla King were tipped.

Cunningham.—Red and grey loam, cropped for the second time; ploughed 4½ inches in March; spring-toothed and harrowed prior to drilling; early sowing made on 3rd May on a moist seed-bed, at the rate of 53 lb. seed and 56 lb. superphosphate per acre; late sowing made on a moist seed-bed on 13th June at the rate of 55 lb. seed and 56 lb. superphosphate.

Balldale.—Red loam, which had produced five crops previously; ploughed 5½ inches in September; harrowed in October; disced in March; harrowed in April; early sowing made on 21st April on a dry seed-bed, at the rate of 55 lb. seed and 56 lb. superphosphate per acre; spring-toothed and harrowed before the late sowing, which was made on 11th June, on a wet seed-bed at rate of 62 lb. seed and 56 lb. superphosphate per acre. The crops were badly affected with Take-all.

Young.—Red loam, very old land; ploughed 6 inches deep at the end of August; harrowed at the end of November; disced in March; harrowed, spring-toothed, and harrowed in April; the early sowing was made on 10th May, on a slightly moist seed-bed, at the rate of 52 lb. seed and 56 lb. superphosphate per acre; land spring-toothed and harrowed before the late sowing, which was made on a moist seed-bed on 12th June, at the rate of 60 lb. seed and 56 lb. superphosphate per acre. The crops were frosted in October, but recovered fairly satisfactorily, although the splendid yields promised were appreciably reduced.

Oaklands.—Red sandy loam, which had produced seven crops previously; ploughed 5 inches deep in August; disced in February and the first week in April, and harrowed prior to drilling; the early sowing was made on a moist seed-bed on 16th April, at the rate of 48 lb. seed and 56 lb. superphosphate per acre; the late sowing was made on a wet seed-bed on 23rd May, at the rate of 55 lb. seed and 56 lb. superphosphate per acre. Owing to the depredations of mice on the late-sown area, the crops there were thin, and Cape weed and wild mustard had an opportunity to make headway, and seriously interfered with the production of good yields.

Henty.—Red loam, which had been under cultivation for twenty-five years; ploughed 4 inches deep at the end of October; harrowed in November; spring-toothed early in February, and again prior to sowing; the early sowing was made on a moist seed-bed on 19th April, at the rate of 55 lb. seed and 56 lb. superphosphate per acre; the late area was spring-toothed prior to sowing, which was made on 14th June on a wet seed-bed, at the rate of 63 lb. seed and 56 lb. superphosphate per acre. Flag-smut was prevalent in the crops.

Culcairn.—Red loam, cropped for the second time; ploughed 6 inches deep early in April; harrowed twice, and scarified prior to sowing; the early sowing was made on a moist seed-bed on 7th May, at the rate of 56 lb. seed and 56 lb. superphosphate per acre; the late sowing was made on a moist seed-bed on 17th June, at the rate of 62 lb. seed and 56 lb. superphosphate per acre. The yields were reduced owing to the presence of Take-all.

Holbrook.—Grey alluvial loam, which had produced three crops previously; ploughed 5 inches deep at end of March, and harrowed; the early sowing was made on a moist seed-bed on 29th April, at the rate of 55 lb. seed and 56 lb. superphosphate per acre; the late sowing was made on a moist seed-bed on 4th June, at the rate of 62 lb. seed and 56 lb. superphosphate per acre. The crops were fed off with sheep three times until 4th September.

Tubbul.—Red loam, cropped for the second time; ploughed 4 inches deep the first week in May, and harrowed; seed drilled on a moist seed-bed on 29th May, at the rate of 55 lb. seed and 42 lb. superphosphate per acre; harrowed after drilling. The yields were reduced owing to the presence of Take-all.

Binya.—Chocolate silty loam, subsoil remote from the surface; four crops had been previously produced; ploughed 4 inches deep at end of August and harrowed after the plough; harrowed on 1st October and in mid-January; spring-toothed the second week in February; the early sowing was made on a slightly moist seed-bed on 2nd May, at the rate of 46 lb. seed and 42 lb. superphosphate per acre; spring-toothed before late sowing, which was made on a moist seed-bed on 5th June, at the rate of 60 lb. seed and 56 lb. superphosphate per acre. The early-sown crops were partially destroyed by rabbits.

Lockhart.—Red clay loam, cropped eleven times previously; ploughed 4½ inches deep in August; spring-toothed in November; disced at end of February; scarified the second week in April; the early sowing was made on a dry seed-bed on 18th April, at the rate of 50 lb. seed and 56 lb. superphosphate per acre; scarified before the late sowing, which was made on a moist seed-bed on 10th June, at the rate of 50 lb. seed and 56 lb. superphosphate per acre; harrowed after the drill. The crops were dirty with black oats and Cape weed, which seriously interfered with the growth of the wheat.

Marsden.—Red to grey clay loam, with gilgai depressions, cropped five times previously; ploughed 4½ inches deep in September; disced in November; spring-toothed in March, and harrowed prior to drilling; the early sowing was made on a slightly moist seed-bed on 11th April, at the rate of 50 lb.

seed and 42 lb. superphosphate per acre; spring-toothed before late sowing, which was made on a wet seed-bed on 20th May, at the rate of 60 lb. seed and 42 lb. superphosphate per acre; harrowed after the drill.

Ungarie.—Chocolate loam, new land; ploughed 4½ inches deep in August; disced 25th January; harrowed 6th March; spring-toothed 6th April; early sowing made on 9th April on a moist seed-bed, at the rate of 44 lb. seed and 42 lb. superphosphate per acre; harrowed before late sowing, which was made on a wet seed-bed on 17th May, at the rate of 51 lb. seed and 56 lb. superphosphate per acre; harrowed after the drill. The land was too "fresh" to produce high yields on such a low rainfall.

Variety Trials.

In twelve districts two sowings were made, so that the early maturing varieties could be sown seasonably during the latter portion of the sowing period. All varieties were manured with 56 lb. superphosphate per acre, excepting at Tubbul, Binya, Marsden, and Ungarie, where 42 lb. per acre was the quantity applied to the early-sown crops.

Federation and Yandilla King were grown in every district, and their yields, therefore, afford a basis of comparison with other late and mid-season varieties. Federation and Canberra will serve a similar purpose with the varieties included in the late sowings.

The season, having such a dry finish, favoured the early maturing varieties such as Canberra.

As a dry season is also more suitable to *Federation*, this variety yielded considerably better in comparison with other varieties than in the two previous seasons, and the average of its yields in the fifteen early-sown plots was 19 bushels 34 lb. It was top yielder in five districts, second highest yielder in four, and third highest in four. It may be said that Federation has come again into its own, for it had fallen somewhat into disfavour with some farmers, owing to its comparatively poor performances during the two previous abnormally wet seasons. Even when sown late in competition with early maturing varieties it yielded highest in two trials out of eleven, and second highest in six.

Yandilla King returned an average yield of 18 bushels 39 lb., or one bushel per acre less than Federation. These two varieties have been grown in all districts in the south for seven years, and the comparison of the average yields over this period is in favour of Federation to the extent of one-third of a bushel per acre. Yandilla King may be regarded as the best variety for early sowing, and it has the added advantage of being a good hay wheat. Being a late maturer the season was not very favourable for it, and the same may be said of all the late maturers.

Major did not give such a good account of itself as in the two previous years' tests. Its average yield was 35 lb. less than that of Yandilla King in the same districts.

Marshall's No. 3, a good old late wheat, returned an average yield of 19 bushels 37 lb., or 40 lb. less than the average yield of Yandilla King

TABLE III.—Showing Results of Variety Trials, Riverina and South-western Slopes, 1918.

Variety.	West Wyalong.	Berrigan.	Deniliquin.	Cunningham.	Balldale.	Young.	Oaklands.	Henty.	Culcairn.	Holbrook.	Tubbul.	Binya.	Lockhart.	Marsden.	Ungarie.
(a) Early and Mid-season Sowing. (44 to 56 lb. seed per acre; 42 to 56 lb. superphosphate per acre.)															
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Federation	27 29	24 24	23 9	24 9	20 15	24 19	22 16	19 23	18 10	17 39	16 15	10 37	14 35	14 31	7 25
Yandilla King	25 55	21 20	24 36	21 26	20 57	22 52	19 51	22 0	19 38	17 19	15 29	...	13 16	11 0	5 29
Bomen	...	22 1	...	24 23	24 52	...	...	...	...	...	15 43	11 0	22 25	14 47	7 15
Major	24 52	23 40	19 8	20 24	19 17	22 56	21 27	23 45	16 23	14 8	14 11	...	16 47	11 13	...
Marshall's No. 3 ...	...	...	...	24 12	20 31	21 48	...	25 0	18 22	11 15	16 11	..	...	...	...
Cleveland	...	...	...	20 50	...	20 53	...	...	14 42	13 16	...	...	...	...	...
Currawa	26 1	21 40	...	21 0	...	...	16 4	...	17 39	...	...	...	...	...	...
Penny	23 52	19 4	...	...	...	...	...	...	17 57	...	...	...	13 51	11 27	...
Roseworthy	..	...	...	...	17 39	22 24	...	22 9	...	13 41	13 43	...	...	...	...
Warden	...	...	18 47	...	...	...	23 27	23 15	17 0	...	...	...	13 52	...	...
Marquis	...	...	...	...	...	18 40	...	18 17	...	...	...	...	...	...	...
College Hunter... ...	...	...	...	14 42	...	13 40	...	...	...	15 29	...	...	...	...	...
Huron	...	19 56	..	...	...	17 7	...	...	14 35	...	...	...	...	...	...
Kharkoff	...	...	...	...	...	16 53	...	16 2	...	...	...	...	...	...	...
Canberra	...	21 47	29 19	...	...	...	...	...	...	...	18 48	...	...	...	..
Clarendon	...	...	21 3	...	...	...	..	...	...	...	13 5	...	...	...	...
Hard Federation ..	...	...	22 25	...	...	...	...	...	...	...	...	...	...	...	...
Improved Steinwedel ...	...	16 32	19 17	...	...	...	...	...	...	...	...	...	...	...	...
(b) Late Sowing. (51 to 63 lb. seed per acre; 56 lb. superphosphate per acre.)															
Federation	24 1	...	...	17 2	17 8	15 21	...	11 52	18 9	18 35	...	12 45	10 8	5 53	6 16
Canberra	29 4	...	...	16 8	22 4	17 36	11 24	9 20	20 13	19 33	...	19 0	8 8	15 14	10 51
Hard Federation ...	23 31	...	...	...	...	...	13 6	...	...	16 0	...	16 43	11 23	...	8 23
Improved Steinwedel ...	22 35	...	...	...	...	...	14 9	..	...	...	..	16 25	...	12 43	8 13
Clarendon	23 47	...	...	...	15 28	13 53	..	8 0	...	...	...	...	...	9 38	9 0
Comeback	19 37	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Florence	...	...	..	.	...	...	...	...	...	...	...	15 0	...	...	...
Bunyip	...	...	...	...	...	...	...	...	...	...	...	15 9	...	...	8 9
Bomen	...	...	...	...	...	...	...	11 23	...	...	...	...	...	...	...
Gluyas Early	...	...	...	...	...	...	...	...	...	...	...	17 33	...	...	...
Golden Drop	...	...	...	...	...	...	...	...	..	...	...	...	..	..	7 16

grown in the same districts. The only other satisfactory late variety was *Warden,* which returned top yield at Oaklands; its chief value, however, is as a hay wheat.

Roseworthy possesses very similar characteristics to Yandilla King, but is inferior as a yielder, as a comparison of the yields of the two varieties will indicate. As it has no other qualities better than Yandilla King, it can safely be discarded. The yields of *Cleveland*, *Currawa*, and *Penny* were disappointing. Two or three trials were made with *Marquis*, *Kharkoff*, *Huron*, and *College Hunter*, all late-maturing varieties. They are very slow growers and require a longer period of growth than is usual in our general wheat districts.

The mid-season variety *Bomen* again demonstrated its value as a grain yielder. In five out of nine tests it outyielded all other varieties, and was close to the top in the remaining tests. Since its introduction six years ago, it has consistently given a good account of itself for the production of both grain and hay.

With regard to early-maturing varieties, the same remark can be made as in last year's report: "There is one variety which stands out above all others, and that is *Canberra*." As the two seasons were the direct opposite of each other, the facts speak volumes for Canberra. In ten out of fifteen tests conducted in different districts, Canberra beat all varieties tested against it, and in three instances its yield exceeded all others by 5 bushels per acre.

Of the other early maturers, *Improved Steinwedel*, *Hard Federation*, and *Early Gluyas* were the most satisfactory. *Clarendon* was upon its second year's trial, but it has not shaped sufficiently well to warrant its recommendation.

The results of the season's variety trials support the recommendation which has consistently been made during the past few years, viz, Yandilla King for early sowing, Federation and Bomen for mid-season sowing, and Canberra for late sowing.

Fallowing Tests.

In four districts, one plot was left unfallowed in order that the yield of the crop grown thereon might be compared wich that produced on fallowed land. At West Wyalong it was not possible to plough the unfallowed plot satisfactorily until very late in the season, and the test was therefore abandoned.

TABLE IV.—Showing Results of Fallowing Tests.

Locality.	Variety.	Yield per acre.			
		Fallowed.		Unfallowed.	
		bus.	lb.	bus.	lb.
Deniliquin ...	... Federation ...	23	9	6	9
Young ...	... Yandilla King ...	22	52	14	55
Marsden ...	... Federation ...	5	53	4	0

The result of the test at Deniliquin, where the rainfall during the growing period is only a shade over 4 inches, is most remarkable, fallowing being responsible for an increased yield of 17 bushels, or 376 per cent. In the more favoured district of Young, the increased yield was also very substantial, viz., 8 bushels. These results are an emphatic proof of the value of fallowing, and should be sufficient to convince farmers that it is far better to fallow a small area and put it in well, than to "slum in" a large area.

Acclimatised v. Introduced Seed.

Tests were conducted in four districts to compare the results of seed introduced by the Department (which had been produced at Wagga Experiment Farm) with seed that had been acclimatised to the district. The latter was the product of seed that had been introduced on the experiment plots one to three years previously, and that had since been carefully graded and grown in the district.

TABLE V.—Acclimatised *versus* Introduced Seed.

Locality.	Variety.	Yield per acre.	
		Acclimatised Seed.	Introduced Seed.
		bus. lb.	bus. lb.
West Wyalong ...	Federation ...	25 48	27 29
Deniliquin	,, ...	22 31	23 9
Young	,, ...	15 49	15 21
Henty	,, ...	20 29	19 33

Graded v. Ungraded Seed.

In order to determine the value of grading seed, plots of ungraded seed were sown in four districts, the variety used being Federation, and the seed being the product of the same crops as the graded seed with which it was compared.

TABLE VI.—Graded *versus* Ungraded Seed.

Locality.	Variety.	Yield per acre.	
		Graded Seed.	Ungraded Seed.
		bus. lb.	bus. lb.
Cunningham ...	Federation ...	17 2	16 0
Balldale	,, ...	20 15	19 13
Lockhart	,, ...	14 35	15 31
Marsden	,, ...	14 31	14 26

The results are not so emphatically in favour of grading as might be expected. At Cunningham and Balldale the graded seed yielded a bushel more per acre than the ungraded seed; at Marsden there was practically no difference; while at Lockhart the ungraded seed returned a higher yield than the graded seed.

Rate-of-seeding Tests.

In order to determine the best quantity of seed to sow per acre, three plots were sown at various rates of seeding—light, medium, and heavy—in seven different districts. The quantity of seed used for the medium seeding was what is considered a fair standard for the district, according to the variety used and the time of sowing. The light and heavy seedings were 12 lb. below and 12 lb. above the standard respectively, or as near thereto as the drill could be set to sow.

TABLE VII.—Rate-of-seeding Tests.

Locality.	Variety.	Date of Sowing.	Light Seeding.			Medium Seeding.			Heavy Seeding.		
			Seed per acre.	Yield per acre		Seed per acre.	Yield per acre.		Seed per acre.	Yield per acre.	
			lb.	bus.	lb.	lb.	bus.	lb.	lb.	bus.	lb.
Berrigan...	Federation ...	28 May...	38	22	44	50	24	24	62	24	23
Oaklands .	,, ...	16 April..	38	22	52	50	22	16	62	21	36
Culcairn ...	Yandilla King	7 May...	44	17	18	56	19	38	68	20	33
Holbrook..	,, ...	29 April..	43	13	1	55	17	19	67	16	25
Tubbul ...	,, ...	29 May..	43	11	52	55	15	29	67	13	39
Binya ...	Federation ...	2 ,, ...	34	8	48	46	10	37	58	10	31
Ungarie ...	,, ...	9 April..	32	5	45	44	7	25	56	6	52
	Average ...	... ...	...	14	37	...	16	44	...	16	17

In every district but one the medium seeding has given the highest yield, and the average of the yields from the medium seeding was 2 bushels 7 lb. greater than the averages returned by the light seeding, and 27 lb. greater than the average of the heavier seeding. These results bear out the experience that 45 lb. to 55 lb. per acre, according to the time of sowing, size of grain, and stooling capacity of the variety, is the best quantity to sow.

Early v. Late Sowing.

This test was carried out with the mid-season variety Federation, early and late sowings being made in eleven localities, but in every instance the sowings were made within the normal sowing season of the particular district.

TABLE VIII.—Early *versus* Late Sowing.

Locality.	Early Sowing.			Late Sowing.		
	Date of Sowing.	Yield per acre.		Date of Sowing.	Yield per acre.	
		bus.	lb.		bus.	lb.
West Wyalong	8 April ...	27	29	18 May ...	24	1
Cunningham	3 May ...	24	9	13 June ...	17	2
Balldale	21 April ...	20	15	11 ,, ..	17	8
Young	10 May ...	24	19	12 ,, ...	15	21
Henty	19 April ..	19	33	14 ,, ...	11	52
Culcairn	7 May ...	18	10	17 ,, ...	18	9
Holbrook...	29 April ...	17	39	4 ,, ..	18	35
Binya	2 May ...	10	37	5 ,, ...	12	45
Lockhart...	18 April ...	14	35	10 ,, .	10	8
Marsden	11 ,, ...	14	31	20 May ...	5	53
Ungarie	9 ,, ...	7	25	17 ,, ...	6	16
Average ...	... .	18	3	....	14	17

The results are emphatically in favour of early sowing, which returned an average yield of nearly 4 bushels more than the late sowing. In average seasons the early-sown crops usually return the best yields, but more particularly is this the case in a dry year.

Manurial Experiments.

In all districts, tests were carried out to determine the best quantity of superphosphate to apply to wheat. At each centre four plots were sown for this purpose, one being unmanured and the remainder receiving applications of 42 lb., 56 lb., and 70 lb. per acre of superphosphate. At Cunningham and Henty an additional plot was manured with basic superphosphate at the rate of 56 lb. per acre.

TABLE IX.—Manurial Experiments.

Locality.	Variety.	No Manure.		42 lb. Superphosphate per acre.		56 lb. Superphosphate per acre.		70 lb. Superphosphate per acre.		56 lb. Basic Superphosphate per acre.	
		bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
West Wyalong.	Federation ..	26	56	27	28	27	29	27	53	..	
Berrigan ...	,, ...	21	29	23	40	24	24	23	18	...	
Deniliquin ..	,, ..	23	4	23	44	23	9	20	55	...	
Cunningham ..	Yandilla King	17	40	19	27	21	26	22	26	18	16
Balldale ...	,, ...	16	19	19	12	20	57	19	12	...	
Young ...	,, ...	14	47	25	52	22	52	25	49	...	
Oaklands ...	Federation ...	11	52	19	15	22	16	23	16	...	
Henty ...	Yandilla King	14	35	20	55	22	0	23	23	...	
,, ...	Bomen ...	......		.....		11	23	......		9	15
Culcairn ...	Yandilla King	13	57	19	35	19	38	21	39	...	
Holbrook ...	,, ...	13	33	15	53	17	19	18	3	...	
Tubbul ..	,, ...	10	19	15	29	15	53	16	43	...	
Binya ...	Federation ...	6	55	10	37	12	40	15	25	...	
Lockhart ...	,, .	10	17	15	20	14	35	13	47	...	
Marsden ...	,, ...	8	10	14	31	12	10	12	14	...	
Ungarie ...	,, ...	3	31	7	25	8	29	8	3	...	
Average		14	13	18	33	19	1	19	28	...	
Average increase due to manure		......		4	20	4	48	5	15	...	
Percentage increase		......		30½		33¾		36		...	

In all districts the results from manuring have been most marked, and at Oaklands and Young increases of over 11 bushels per acre were returned. The standard quantity of superphosphate, viz., 56 lb. per acre, returned an average increase per acre of 4 bushels 48 lb. over the unmanured plot, or 33·75 per cent. This is the highest percentage increase in these tests for the past seven years; usually the increase is about 25 per cent. to 30 per cent. By increasing the quantity of superphosphate to 70 lb. per acre, a further average increase in the yield of nearly half a bushel resulted, and the percentage increase over the unmanured plot was 36 per cent. The marked improvement of yield as the result of the use of manure can be attributed to the fact that superphosphate stimulates root production, and consequently the crop had a greater foraging area from which it could extract its supplies of moisture, and the roots penetrated the subsoil where the moisture was conserved. Furthermore, superphosphate hastens the maturity of the crop, which was an advantage in a season with such a dry finish.

Crop Harrowing Tests.

For the purpose of determining whether the practice of harrowing a growing crop is beneficial, two plots of Federation were sown under exactly similar conditions in three districts, one plot being harrowed and the other left untouched.

TABLE X.—Crop-harrowing Tests.

Locality.	Variety.	Date of Harrowing Crop.	Yield per acre.			
			Crop Harrowed.		Crop not Harrowed.	
			bus.	lb.	bus.	lb.
Berrigan ...	Federation ...	18 July...	24	24	22	51
Deniliquin ...	,, ...	30 ,, ..	23	9	22	36
Tubbul ...	,, ...	2 ,, ...	17	23	16	15

The practice of harrowing the growing crop has been responsible for increased yields varying from half a bushel to 1½ bushels per acre.

Oat Trial.

A variety trial with oat crops was carried out in four districts. In each case the land received the same cultivation as for the wheat experiments.

TABLE XI.—Oat Variety Trial.

(45 to 50 lb. seed per acre ; 56 lb. superphosphate per acre.)

Locality.	Date of Sowing.	Ruakura.		Guyra.		Lachlan.		Algerian.		Sunrise.	
		bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Young	10 May ...	41	3	40	5	40	23	23	4	......	
Cunningham ...	3 ,, ..	45	36	32	17	26	15	25	34	......	
Holbrook ..	4 June ...	31	9	27	4	20	2	23	16	......	
Marsden ...	11 April ...	......		......		......		27	8	18	33

The season was not so suitable for Algerian as for the earlier maturing varieties. Ruakura stood out as the best yielder, and performed considerably better than in the tests of previous years.

A Suggested Standard for Pollard.

A NOTE ON THE AQUEOUS EXTRACT OF POLLARD AND ITS BEARING ON A POLLARD STANDARD.

G. W. NORRIS, Chemist's Branch, Department of Agriculture.

MUCH difficulty has been recently experienced by poultry-farmers in obtaining sufficient first-class pollard, due chiefly to the fact that millers are obliged to grist a considerable portion of second quality wheat.

It is therefore desirable that there should exist some standard for pollard, below which it should not be designated as such.

Any definition which insists on a certain process of manufacture is unsatisfactory, as it would not be possible to judge from the finished product whether the conditions had been complied with, nor would it be possible to institute adequate inspection during the actual process of manufacture.

The usual analysis showing the proportion of nutritive substances present is not entirely satisfactory for the purpose, and is moreover a rather tedious operation.

It was thought that a determination of the amount extracted by water under prescribed conditions might afford a rapid and sufficiently accurate guide to the quality of the pollard, and the subjoined experiments were carried out with this object in view.

Method of Extraction.

The details of the method finally adopted for the preparation of this "water-extract" are as follows :—

Take 25 grammes of pollard and place in an oblong bag about 6 x 9 inches, made of No. 11xx flour-dressing silk. Stand the bag in a glass mortar (of about 6 inches diameter); add 200 cubic centimetres of water, and proceed to knead the pollard in the bag. After a few minutes' kneading pour off the water (which has a chalky appearance) into a 500 c.c. measuring flask. Add another 100 c.c. of water to the pollard and knead and pour off as before. Four changes of water are usually sufficient to extract all the water-soluble matter from the sample. Squeeze the bag with the hand, catching all the wash-water and fill the flask up to the 500 c.c. mark. Take 50 c.c's. of the solution and evaporate to dryness in a porcelain dish (the weight of which has been noted) upon a water bath; when dry place in a water oven and dry for one hour; cool and weigh. The increased weight which will be obtained represents the extract from 50 c.c's. or 2·5 grammes of pollard; the percentage can then be easily calculated.

The Method Tested.

In order to test the method, samples were collected from city and suburban flour mills and produce stores. On account of the rough appearance of the samples, it was decided to grade them with different mesh sieves.

The attached table shows the percentages of the different grades, as well as the water-extract :—

Number of Sample.	Tailings from No. 20 G.G.	Tailings from No. 30 G.G	Tailings from No. 50 G.G.	Throughs of No. 50 G.G.	Water-extract.
	per cent.	per cent.	per cent.	per cent.	per cent.
1	6	14	45	35	61·7
2	1	21	41	37	55·8
3	7·3	9·4	38·3	45	53·6
4	6	14	39	41	54·1
5	1	19	24	56	62·0
6	traces	17	35	48	......
7	traces	3	20	68	65·7

No. 1 is a very good sample of pollard, showing 6 per cent. of stock that tailed off a No. 20 grit gauze sieve, which consisted principally of wheat germ. It compares very favourably with sample No. 5 from a water-extract point of view, being 61·7 per cent.

Sample No. 7 is a fine, soft, white, country pollard, and shows the highest water-extract.

Realising the ease with which the miller can cut up the bran and place it on the market to-day as pollard, it is interesting to know how it will affect the quality. A good sample of bran was obtained, a portion of which was ground fine enough to pass through a No. 20 G.G., and the water-extract determined.

Water-extract from original bran	27·8 per cent.
,, ,, ground bran	38·5 ,,
,, ,, No. 7 country pollard for comparison...	65·7 ,,

From these figures, one can see at a glance that the addition of bran to pollard must decrease the water-extract of a pollard to which bran has been added.

Pollard being a by-product from a flour-mill, the quality depends mostly upon the flour that the miller has been unable to recover. To illustrate this fact two samples of wheat were milled, extracting three different proportions of flour in each case. One was a good commercial sample, weighing 61 lb. per bushel, the other a light pinched sample weighing 54 lb. per bushel.

The following are the results of the different flour extractions expressed in percentages :—

		61-lb. Wheat.	54-lb. Wheat.
		per cent.	per cent.
First milling	Bran	15·3	12·5
	Pollard	17·8	27·3
	Flour	66·9	8·2
	Loss on cleaning ...	......	2·0
Second milling	Bran	15·3	12·5
	Pollard	12·3	20·7
	Flour	72·4	63·8
	Loss on cleaning ...	......	3·0
Third milling	Bran	15·3	12·5
	Pollard	10·0	14·1
	Flour	74·7	70·4
	Loss on cleaning ...	......	3·0

The percentage of bran is the same in each case. The flour yield was increased after each reduction, and the percentage of pollard decreased.

The following figures show how the yield of flour affects the quality of the pollard :—

	Flour Yield from 61-lb Wheat.	Water-extract of Pollard.	Flour Yield from 54-lb Wheat.	Water-extract of Pollard.
	per cent.	per cent.	per cent.	per cent.
First milling	67·0	60·4	58·0	59·6
Second milling	72·5	52·8	64·0	53·6
Third milling	75·0	45·6	70·0	48·0

When comparing the bran from these two wheats, the 61-lb. wheat produced (as would be expected) a better quality bran, being somewhat broader, and giving a slightly higher water-extract. This extract figure can be increased by grinding the bran sufficiently fine to pass through a No. 20 grit gauze sieve.

The bran extracts are as follows :—

	61-lb. Wheat.	54-lb. Wheat.
Water-extract from whole bran ...	32·8 per cent.	30·7 per cent.
,, ,, ground bran ...	40·8 ,,	37·6 ,,

Screenings containing broken and pinched grain mixed with chaff when ground fine give as high as 48 per cent. water-extract. This figure, of course, will alter according to the amount of grain contained in the screenings. When screenings rich in broken grain are added to pollard they could not be recognised by determining the water-extract.

If straw and whiteheads without grain are added to pollard, then the percentage of ash would be a guide, as one sample gave as high as 9 per cent. ash. But the ash of a good sample of screenings is as low as 5 per cent., while a pollard will give an ash as high at 4 per cent. Considering the small amount of ground screenings that is added to pollard in the flour mill the determination of ash would not be of much value.

Recently, I understand, millers were grinding wheat that at one time would be sold as chick-wheat. The pollard from this type of wheat would most likely fail to come up to the proposed standard. Therefore, it appears to me that it will be necessary to fix a standard water-extract annually.

Up to the present, with one exception, all pollards that have been tested yield slightly over 50 per cent. water-extract.

Although there was a marked difference in the appearance of the pollards collected, there was not one that could be classed as brown middlings.

The amount of water-extract (as determined by the washing method, using No. 11xx flour-dressing silk) that a sound pollard should contain, I would suggest, should be not less than 54 per cent.

All samples yielding less than 54 per cent. should be classified as brown middlings, and sold as such at a price less than pollard.

The average water-extract of the city and suburban pollard up to the present is 54·3 per cent.; when country pollard is included the average is 56·5 per cent.

As there are a number of different kinds of wheat-cleaning machines in use at the present time, it appears to me to be so much waste of time stating definitely what sieve stock should not go to pollard, particularly as the sieves are interchangeable according to the "feed" required by the mill.

For example, if the wheat coming forward is very dirty with whiteheads, the tailings of two top sieves would be directed to the mill thrasher, then back to separator, when the bulk of it would pass through the sieves.

Before we could dictate to the miller, we would have to first find out the best wheat-cleaning machine on the market, then have it fitted with sieves of a standard mesh.

Definition of Pollard.

The definition that I would suggest as most suitable for fixing a standard is as follows:—

> Standard pollard shall consist of the product of milling wheat other than flour and bran.
>
> It shall be sufficiently fine to pass through a No. 20 grit gauze, and shall contain not less than 54 per centum of water-extract obtained by washing through a No. 11xx flour-dressing silk.

Trials with Malting Barley.

A. H. E. McDONALD, Chief Inspector of Agriculture.

ALTHOUGH increased attention has been paid to malting barley of recent years, maltsters still find it necessary to purchase large quantities outside the State. The principal sources of supply at present are Victoria and South Australia, but prior to the war supplies were largely imported. Local maltsters state that they find the local product is of excellent quality, and there appears to be no reason why our own farmers should not supply all that is needed. As a matter of fact, a leading maltster has noted that New South Wales barley appears to contain a larger percentage of diastase than barley obtained elsewhere, and that the grain from the northern part of the State is richest in that constituent, while that from the central west is less so, and that from the south slightly less again. This is an interesting point in view of the fact that superphosphate has a very beneficial effect in the south, while in the west its effect is not so pronounced; and it is still less so in the north. There is probably a connection between the two facts, the natural fertility of the northern soils producing a grain of higher quality. If this point can be definitely established, it will have a most important effect, as it will probably lead to New South Wales barley becoming popular in other markets than our own, and thus creating a very large demand for it.

Many farmers are under the impression that barley is so liable to damage by rain when ripe, that it is almost impossible to be certain of securing a sample that is suitable for the maltster. A leading buyer, however, states that in some cases the grain is actually improved by showers after it has ripened, and that it is very rarely that a barley is rejected on this account.

It is also considered by many that a good sample cannot be obtained unless the crop is reaped and threshed, but recently several samples which were taken off by the harvester were submitted for appraisement to a buyer who operates on a large scale; his valuations ranged from 6s. 3d. to 6s. 7d. per bushel, and he stated that the latter was as good a barley as any he had handled.

To secure the best results clean land should be selected, as the presence of other seeds, such as wheat or oats, is undesirable and reduces the value of the crop, or at any rate necessitates special treatment to remove these grains. It is also necessary to exercise care in harvesting, as the maltster does not like barley which has the hull or skin broken. Setting the beaters of the machine well up obviates this. It is not objectionable if some of the awn is left on the grain, as this can be removed by the maltster with his dressing machine.

True malting barley is of the two-row type, such as Goldthorpe, Kinver, &c., but a considerable quantity of the six-row (Cape) type is also required by maltsters for mixing with the other. During recent years the Department of Agriculture has introduced into cultivation some improved varieties of the six-row or Cape type, which are highly recommended by maltsters. It must be understood that these sorts cannot take the place of the two-row types, but are used in conjunction with them. The demand for grain of the Cape type, however, is large, and farmers could profitably give it their attention. The payable nature of barley as a crop can be gauged from the fact that the yield is considerably heavier than that of wheat, while the prices offered by maltsters are considerably higher. At Wagga Experiment Farm barley has been grown for many years, and the net returns per acre have invariably been higher than those obtained from wheat.

Barley is generally considered to require a good and a well distributed rainfall, but this is not borne out by results. During last season, which was unusually dry, the yield of barley was higher than that of wheat to the extent of 15 to 20 per cent. At Balldale, barley gave 5½ bushels per acre more than Yandilla King wheat, although, as the Inspector in charge of the experiments reported, the loss of barley was about 33 per cent., owing to the harvesting being somewhat delayed. In the Gilgandra district, where the season was abnormally dry (only 5 inches of rain having been recorded during the growing season, and during the last three months only 58 points), a yield of 16 bushels of barley was obtained as against 15 bushels of wheat.

Farmers are not advised to grow large areas of barley; but up to 50 acres to each harvesting machine can be safely sown. The crop can then be handled expeditiously when ready.

Samples of the barley grown on the experiment farms and farmers' experiment plots were submitted to Messrs. Tooth & Co. for valuation. The prices were fixed on the rate then ruling. In the past barley has always brought a higher price than wheat, and it is unlikely that it will be otherwise during the next few years. It is worthy of note that the barley grown on farmers' experiment plots was garnered by means of the harvester. As the maltster's valuations of the grain were very satisfactory, this indicates that reaping and threshing separately is not essential. The following figures give some idea of the yields obtained last season from this grain :—

BARLEY AND WHEAT YIELDS COMPARED. SEASON 1918.

Locality.	Barley.						Wheat.			Rainfall during Growth.
	Golden Grain.	Goldthorpe.	Kinver.	Pryor.	Cape.	Cowra No. 36 (6-row).	Marshall's No. 3.	Federation.	Yandilla King.	
	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	inches.
J. T. Maunder, Pallamallawa ...	7 32	...	...	...	6 24	...	...	...	...	...
J. Plumb, Crookwell	...	...	...	...	...	20 14	20 16	...	18 43	19·65
H. J. G. M. Thackeray, Wootoona, Young.	...	28 17	...	...	...	...	...	24 19	22 15	9·57
A. McDonald, Bright View, Balldale.	...	23 31	26 20	...	...	...	...	20 15	20 57	12·26
R. O. Eulenstein, Gracevale, Henty.	...	27 29	...	...	...	...	25 0	19 33	22 0	10·69
J. Parslow, Kelvin Grove, Gilgandra.	...	...	16 10	...	14 10	...	...	15 1	...	5·08
Cowra Experiment Farm ...	...	...	...	33 0	...	...	...	22 36	25 0	...

The figures from Wagga Experiment Farm are presented separately. At this Farm the barley crop was cut with the reaper and binder and threshed. Kinver was used as a check, and the other varieties were sown in duplicate.

WAGGA EXPERIMENT FARM.

		bus.	lb.
Barley—Plot	1. Kinver ...	32	10
	2. Goldthorpe ...	24	25
	3. Cowra No. 21 ..	26	35
	4. Kinver ...	26	15
	5. Goldthorpe ...	23	25
	6. Cowra No. 21..	27	35
	7. Kinver ...	23	30
Wheat—	Yandilla King ...	19	40
	Hard Federation ...	19	40

Samples of the above yields were forwarded by the Department to Messrs. Tooth & Co., Ltd., who commented on the various samples that they gave indication of unfavourable conditions during growth and had not filled as well as was desirable. They remarked, however, that they would be pleased to purchase lines of the quality of any of these samples, and in furnishing valuations for the different samples they did so on the basis of the condition of the market at that time.

With regard to the sample of Golden Grain from Pallamallawa, they wrote :—" It would appear that this sample has been grown under adverse conditions. It has not filled uniformly . . . . The colour is satisfactory, but not of the best. This sample has not been harvested satisfactorily, a large percentage of the corn being damaged by over-close dressing. Probably the condition of the crop owing to the dry season has rendered it very difficult to do better on this occasion." Valuation, 6s. 1½d. per bushel.

Cape Barley.—" Conditions during growth have evidently been unfavourable in the case of this barley. It is thin, contains a considerable percentage of screenings, also smut and wheat. We would purchase such barley for malting, though the quality is far from what is desirable." Valuation, 4s. 8d. per bushel.

With regard to the Kinver and Goldthorpe varieties from Balldale, the maltsters wrote :—" We have little comment to make beyond the fact that the samples were of excellent malting qualities. We note the presence of a small percentage of wild oats in each." Valuation of Kinver, 6s. 3d. per bushel; of Goldthorpe, 6s. 6d. per bushel.

The sample of Goldthorpe from Henty was commented upon as of excellent malting quality. Valuation, 6s. 7d. per bushel.

The Goldthorpe sample from Young was also remarked upon as of excellent malting quality, but the presence of a small percentage of wild oats was mentioned. Valuation, 6s. 6d. per bushel.

With reference to the sample of Pryor from Cowra Experiment Farm, Messrs. Tooth & Co. wrote :—" This shows a certain amount of discoloration, which appears to us to be due to the inclusion of outside or bottom sheaves in the threshing of the bulk. This is a practice which we have frequently cautioned farmers against, and which should be carefully avoided. Weathered or discoloured sheaves should be placed upon one side and threshed separately for feed or purpose other than malting, as their inclusion with the bulk is very apt to affect detrimentally the malting quality, if not altogether spoil it, owing to a large percentage of corns of which the vitality is impaired. We noticed smut in this sample, but the barley is mellow and the quality good. It has been satisfactorily threshed, and had the colour been bright, the sample would have been of first-class quality. We would be pleased to purchase such barley, and would offer 6s. 3d. per bushel for it."

The maltsters also valued samples of Kinver at 6s. 4½d. per bushel, remarking that the sample was not quite as uniform as is desirable for malting, but this could easily be remedied by grading; and samples of Abed Binder and Cowra No. 21 at 6s. 6d. per bushel in each case. Several samples of six-row barley were also submitted from Cowra Experiment Farm, and were variously valued for malting purposes at from 4s. 9d. to 5s. 1d. per bushel.

With regard to samples from Wagga Experiment Farm the same firm made the following remarks :—

Pryor.—" This sample shows the desirable feature of uniformity and the colour is particularly good, being of that golden yellow more desirable for our purposes even than the lighter colour of the other three lines. The grain is mellow and every way satisfactory for high quality malt, although it might with advantage have filled better. Harvested satisfactorily, though we note an occasional half-corn." Valuation, 6s. 4½d. per bushel.

Kinver.—" The colour of this is brighter than the sample just referred to, but we do not consider it quite as desirable. This barley somewhat lacks uniformity, containing a fair percentage of screenings and a certain percentage of " hollow-backs " corns, indicative of the lack of moisture at the right period of the grain's development. A few black oats are seen in this sample. . . . ." Valuation, 6s. 3d. per bushel.

Goldthorpe.—" Colour bright, showing a yellow tinge which is not detrimental. This sample also lacks uniformity to a certain degree. . . . Harvesting could have been improved upon as there is also a percentage of skinned corns in this sample." Valuation, 6s. 1½d. per bushel.

Golden Grain.—" Colour bright and satisfactory. Lacks uniformity, and contains a higher percentage of screenings than above-mentioned samples, but has been better harvested. . . . ." Valuation, 6s. per bushel.

Some Plant Bugs that Infest Citrus Trees.

W. W. FROGGATT, F.L.S., Government Entomologist.

ORANGE and lemon trees not only thrive and are largely cultivated in our coastal areas, but they also do well in the gardens of the inland towns and station homestead gardens. Their dense evergreen foliage naturally attracts numbers of indigenous insects, many of which simply come for shelter; but a number are known to have transferred their attentions from their natural food plants, and now do a great deal of damage to these trees and their fruit.

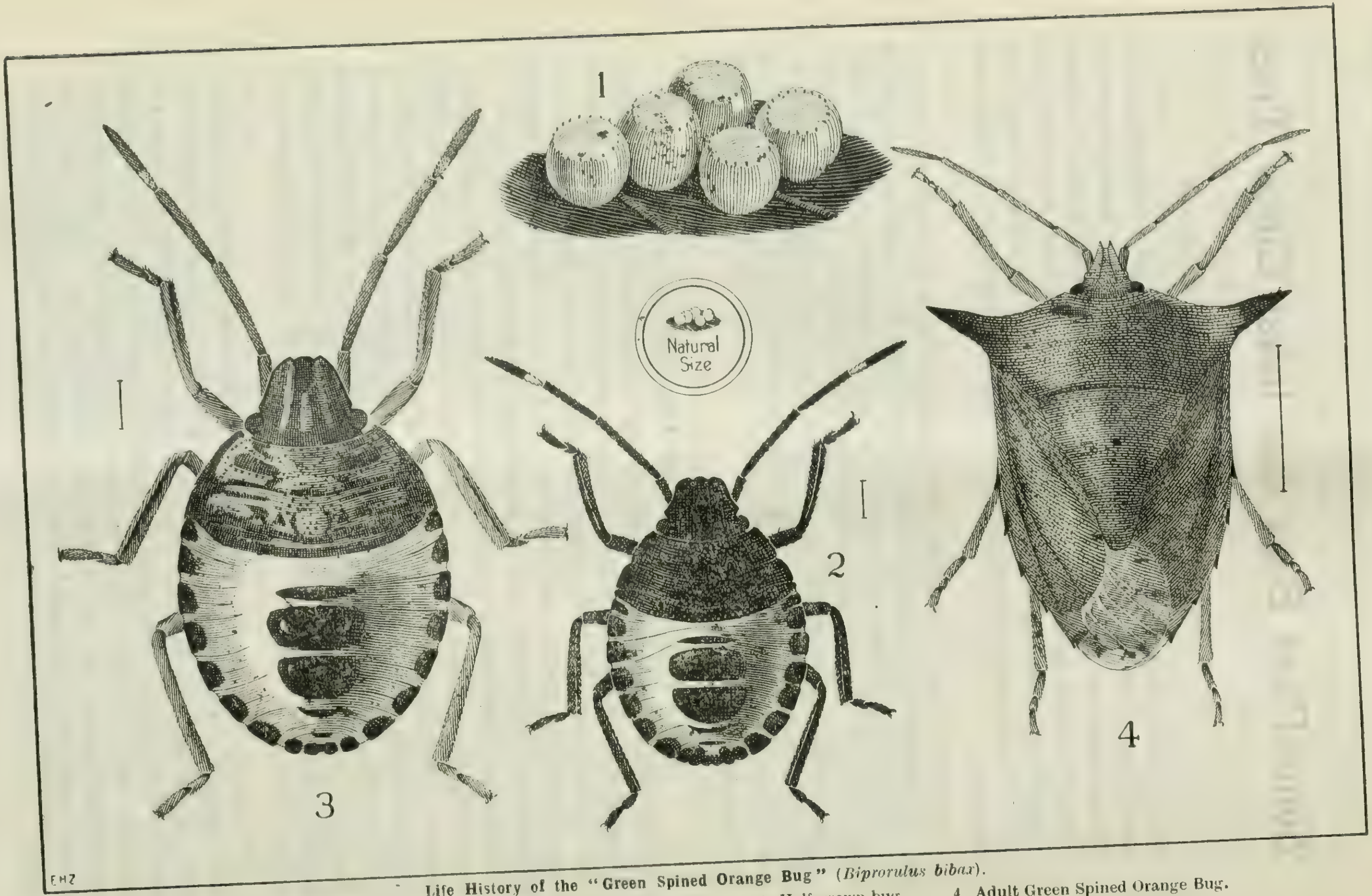
Among the many interesting branches of study in economic entomology, is the remarkable instinct that many insects have in recognising the relation of the cultivated plants and trees to the native vegetation upon which they feed, and the rapidity with which they will desert their hardy and robust native food plant to attack the more succulent cultivated plant belonging to the same family. The following notes on several of our plant bugs infesting citrus trees are well worth recording, as they deal with their natural food plants and life histories.

The Green Spined Orange Bug (*Biprorulus bibax*).

This large bug was described as an orange tree pest in "Insect and Fungus Diseases of Fruit Trees," published in this Gazette in 1899 under the name of *Rhynchocorus* sp. In 1901, under the identification of *Biprorulus bibax*, it was figured in colours and described in Part 1, "Notes on Australian Hemiptera," and is also noted on page 330 in "Australian Insects."

This is a typical, broad-shouldered shield bug, with long legs and antennæ, measuring about ¾ of an inch from the front of the head to the tip of the abdomen, and about the same width across the shoulders from the base of the prothoracic spines. The prothorax is turned down in front to the pointed head, swelling out on the sides, which are produced into stout pointed spines; the outer margin behind the spines and the body rounded to the apex. General colour bright green, with the extremities of the spines tipped with reddish brown.

They are very active creatures, and when disturbed fly readily; in cover they appear to trust to their remarkable protective coloration harmonising with the foliage and do not move. The eggs are deposited in clusters of about a dozen side by side upon the upper surface of the leaf, or sometimes upon the side of a fruit. They are glassy, semi-transparent, hemispherical, and covered on the top with a flattened star-ribbed lid. The young ones are dull green, more elongated than the adults, and barred with brownish black.



Life History of the "Green Spined Orange Bug" (*Biprorulus bibax*).

1. Eggs on orange leaf. 2. Young bug on emergence from egg. 3. Half-grown bug. 4. Adult Green Spined Orange Bug.

These insects have a wide range. They were first recorded as pests from the citrus orchards of the Northern Rivers; and as the "Finger Lime" (*Citrus australasica*) is a native of the coastal scrub, it is probably their host-plant in the north of New South Wales. Later on they were recognised in the citrus orchards in the Gosford district, and in other parts of the Hawkesbury River; and for several years they have been invading the home-station orchards of the north-west, from Moree northwards to Garah, thence south to Coonamble, and in most cases they show a marked preference for the lemon trees. Early in December Mr. George Smith, of Budgeree, Garah, sent me several clusters of eggs from his garden. None of these produced a bug, as they were all infested by a minute chalcid wasp parasite, which came out in the observation jar. The presence of this parasite evidently accounts for them not becoming a more serious pest in the orchards in the north-west.

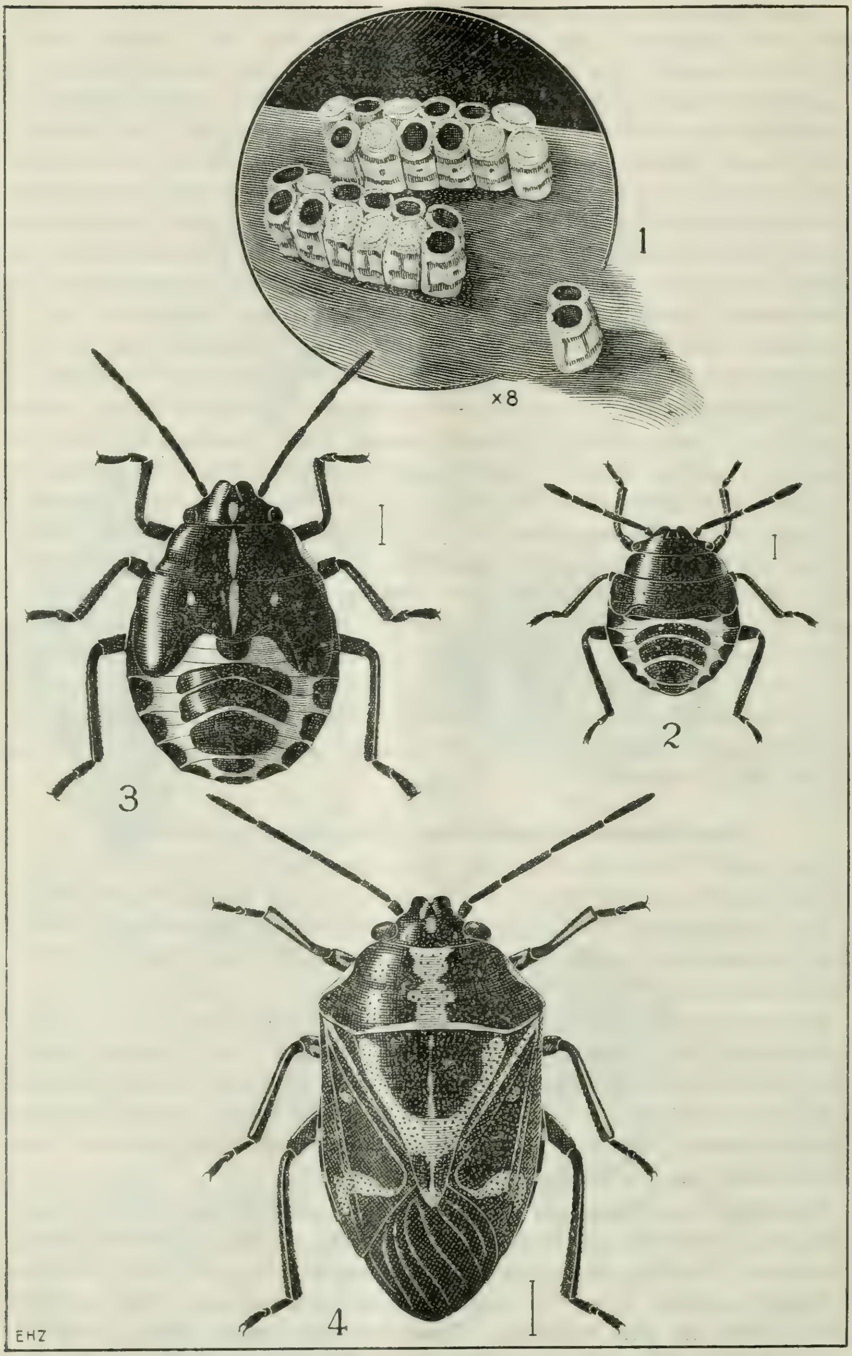
In working out the life histories of local insects in the Moree district, those upon the "Native Lime" (*Atlantia glauca*) were investigated. Early in December numbers of the "Spined Orange Bug" were found resting among the spiny branchlets, and were sucking the juice out of the small, rounded, ripening fruits. This is evidently, in the north-west, their natural food plant, from whence they have found their way into the station gardens and discovered the cultivated citrus trees. On their native food plant they represent a striking case of protective mimicry, not only in form, but also in coloration, for the slender shoulder spines are tipped with reddish brown, just like the long spines on the wild lime. The bugs seem to know their mimic powers; for, enveloped among the thorny branchlets, they cling to the twigs and do not drop to the ground as they do when found among the more open foliage of the cultivated lemon trees.

The Painted Capparis Bug (*Stenozygum personatum*).

This pretty little shield bug has a wide range over the eastern portion of Australia. Walker described it from Australia in his British Museum Catalogue, Hemiptera, in 1867. Distant described it from Queensland in 1881.' It is common in the scrubs on the Tweed River, and ranges out west to Moree and Nyngan in New South Wales.

Towards the end of January the writer found them in all stages of development among the foliage of the "Wild Pomegranate" or "Bumble Tree" (*Capparis Mitchelli*), growing on the banks of a creek near Moree. A little later, specimens were received from Mr. A. Lucas (Stock Inspector in the Nyngan district), that had been taken upon an orange tree where they had been doing considerable damage.

The perfect insect measures slightly over ¼ of an inch in length, but is longer than broad, with the prothorax angular in front, sloping down to the head, the sides of the wing covers straight to the centre of the scutellum, and then forming a rounded tip. The surface is dark bronzy brown, richly mottled with yellow and pink markings. These form an elongate stripe down the centre of the head, with a transverse patch below the eyes, and finer lines on



Life History of "Painted Capparis Bug" (*Stenozygum personatum*).

1. Eggs upon leaf of *Capparis Mitchelli*. 2. First stage of bug. 3. Half-grown bug. 4. Perfect bug.

the sides in front of the head. The outer margin of the thorax is touched with yellow, with a broader transverse band through the centre shaded with pink; the scutellum is mottled with yellow and pink, but these markings are variable. The elytra are barred with five parallel lines of yellow blotched with pink, with smoky brown hind wings. The under-surface is yellow, spotted along the sides, and the legs are variegated yellow and brown. The eggs are deposited upon the foliage in little clusters; they are greyish brown, circular boxes, covered with a slightly concave close-fitting lid, like a saucer, and can be better understood by reference to the plate than described.

In their development from the eggs the little bugs vary considerably in colour after each moult, as is in a measure indicated in the accompanying plate illustrating their life history. They are very active little creatures, running about among the foliage and dropping to the ground when disturbed.

The Painted Horehound Bug (*Agonoscelis rutila*).

This brightly coloured shield bug was originally a native of North Queensland, common about Cairns and Mackay. About fifteen years ago the writer collected a number of them on a tree-trunk at Tweed Heads on the Queensland border; and it appears to have followed the railway line southwards to below Sydney, and to have spread out some distance to the west. It is invariably found feeding upon horehound (*Marrabium*), an introduced plant, and is evidently following and extending its range with its food plant.

It measures about ½ an inch in length, and is somewhat elongate in form, with the prothorax sloping down to the head; angulated on the sides, and rounded on the hind margin. The sides of the wing covers are straight to the centre of the scutellum, with the body rounded to the apex. The ground colour is deep vermilion red, mottled with shining black. The head is outlined with black, with two parallel lines between the eyes, four small blotches on the prothorax, three smaller ones on the scutellum, the centre of the upper, and the whole of the apical portion of the elytra and hind wings black. The antennæ, legs, and the under-surface are barred with black lines.

During the last month a correspondent from the Gosford district sent in specimens of this shield bug, with the information that they were swarming into his orange trees, but he had not noticed any damage from their presence.

Suggestions and Remedies.

On account of their peculiar structure and method of feeding through the surface of the bark, shield plant bug pests are always a difficult problem to deal with. It is of no use to spray with a poison on the food plant; and a contact poison falling on the shield-protected backs of the adult bugs simply falls off in most cases without the oil reaching the spiracles.

When orchard trees are badly infested with swarms of immature bugs, as is often the case, a kerosene or oil emulsion mixture well sprayed among the foliage, will kill the soft wingless larval forms. Jarring the branches, after placing a sheet on the ground well under the tree, will often bring down the bugs in large quantities when mature, when they can be gathered up with the sheet and turned into a bucket or tub of boiling water or cold water into which a little kerosene has been thrown. Jarring, *i.e.*, tapping each main branch with a stick, is preferable to shaking the branches, as it does not bring down any fruit; the unusual jar causes the bugs to relax and drop, much more easily than a simple shake. If this work is done in the early morning when the bugs are semi-torpid and inactive, it is much more successful than later on when the bugs are active and moving about, and fly off instead of falling.

On valuable citrus trees with a good crop of fruit, orchardists on the Northern Rivers, when dealing with the Bronzy Orange Bug, have found that it will pay to cover them with a sheet and fumigate with hydrocyanic acid gas. The fumes generated rapidly kill the infesting bugs in all stages of development.

WINTER SCHOOLS FOR FARMERS, 1919.

ARRANGEMENTS have been made for the annual Winter School for Farmers to be held at Hawkesbury Agricultural College from 17th June to 12th July next. The syllabus covers a comprehensive course of lectures and demonstrations on Agriculture, Horticulture, Live Stock, &c., and in addition, practical training is available in useful work connected with farm life, such as saddlery, engineering, blacksmithing, carpentry, &c.

To meet a popular demand a special school will be held for those who desire to specialise in the subject of poultry farming. All branches of the industry will be fully dealt with, and moreover, the students will be given an opportunity of studying such subjects in the general course as are likely to be of value to them.

Farmers or their sons, over 16 years of age, who have been engaged in rural work for at least one year, will be eligible for admission to the general course, and admission to the poultry course will be granted to persons of both sexes over the age named who are engaged in poultry farming.

Applications for both schools will close on 31st May, 1919.

The fee for either course, inclusive of board and lodging, will be £3 3s. Prospectus and full information may be obtained on application to the Under Secretary and Director, Department of Agriculture, Sydney.

Clovers and Trefoils at Yanco Experiment Farm.

E. B. FURBY, Experimentalist.

THE adaptability of several varieties of clover and trefoil to the Murrumbidgee Irrigation Area has again been demonstrated, as the following descriptions will go to show. The winter of 1918 could not have been more favourable to the successful trial of either grasses or clovers. All varieties grew very well with the encouragement of a good rainfall, till the approach of dry adverse weather, accompanied with much wind, in August and September. This caused a check in growth, which had the effect of maturing the clovers sooner than would have otherwise been the case. Irrigation was resorted to, and waterings were made on 14th September and 2nd October, but in the absence of favourable growing weather then, these waterings did not have the desired effect of maintaining the normal and vigorous condition of the plants.

Towards the end of October, when the majority of the varieties were flowering, they were cut down, and from the weights obtained, acre-yields were computed as follows :—

Variety.	Plot Yield.	Computed Acre-Yield.			
	lb.	t.	c.	q.	lb.
Subterranean Clover	38·5	3	8	3	0
Medicago tuberculata	62	5	10	2	24
Crimson or Red Clover ..	45	4	0	1	12
Chilian Clover	39	3	9	2	16
*Egyptian Clover	32	2	17	0	16

* Three cuts of this variety were obtained, making a total yield of 8 tons 11 cwt. 1 qr. 20 lb. per acre for the season.

The length of row from which these weights were taken corresponds to 1/200th of an acre, and it must not be assumed that such yields can be obtained from any acre of such clovers, as they are merely an illustration of the extent of the growth of the clovers as tried here, and serve as a guide as to their individual values. Under grazing conditions they may not grow to such proportions.

The cultivation of these clovers and spineless burr trefoils, or the most useful of them, is absolutely essential in the formation of pastures in connection with the development of the dairying industry on the irrigation area. In the absence of well-prepared pastures as a reinforcement for specially-grown fodder crops, the dairyman, confined to the smallest areas, has literally nothing to depend upon.

Subterranean Clover (*Trifolium subterraneum*).

In previous years this clover has been recorded as one of the most promising among those on trial at this Farm. The growth last winter upheld this opinion, as far as this clover can be classed as a winter grower, but its failure to retain that growth during the spring, even with irrigation, must leave an element of doubt as to its probabilities in a spring and summer which happen to be unusually dry.

During the past winter, as has been the case every winter since it was sown, it made a remarkable growth, the three rows originally sown extending to seven, and these again have almost merged into one unbroken plot, forming a dense mat 4 to 5 inches deep, of extremely succulent feed, suitable for either dairy cattle or sheep. The proportion of leaf to stem, both of which are slightly hairy, in these old-established rows, is not very high, most of the mat being composed of long, soft bare stems.

The dry weather which followed the cessation of rain in August demonstrated that this clover could not withstand even the slightest period of drought. Although irrigated, it was noticed to be the first to show signs of wilting when other clovers retained their normal appearances, besides being the slowest to respond to water after irrigating.

Although not tried extensively under grazing conditions here, it was included in a mixture of grasses and clovers for a winter pasture, sown in the autumn of 1917, which pasture was fed off by sheep at various times. No growth of any consequence was noticeable with the clover in this plot, only a few individual plants being scattered over the paddock, which ceased to exist in the spring and summer, although constantly watered.

Whether sufficient seed was sown, or whether some other outside influence was the cause of its meagreness in this plot, it appears that, to maintain a prolific growth of this clover, irrigation alone is not all that is necessary, but must be accompanied by suitable weather and a certain amount of rain, thus minimising the baking of the soil under the summer sun, which action has a damaging effect upon its fine, shallow fibrous rooting system.

Given a fair season it is reasonable to assume that a good lasting stand could be made with the assistance of its underground spreading habit and heavy seeding capabilities, provided careful attention is given. And once established, a more promising result might be expected, providing it is allowed to set seed annually. Its seed is covered with a fibrous jacket, with many flimsy projections, giving it that characteristic so common to the seed of many of our native grasses and other plants, which enables them to survive on the soil surface for a number of years. Such seeds as are not forced into the ground by the natural growth of the plant would thus be scattered on the surface of the soil and act as a means of perpetuating the crop from year to year.

The growth on one row of this clover was cut and weighed, the equivalent acre-yield being 3 tons 8 cwt. 3 qrs.

Chilian Clover.

The value of this clover lies in its perennial habit, and the fact that it continues to grow throughout the hot months of summer, when other clovers have dried off, as well as during the winter months. The maximum growth is reached in the late winter and early spring. Rows planted in 1916 are still in a live state of growth, having been harvested last October, when the stools of fifty or sixty stalks had developed into plants from 18 inches to 24 inches across. The stalks, which are moderately fine and succulent, grew 2 feet 6 inches high, carrying large, soft, and smooth leaves to their very base. The amount of greenstuff from one cutting was equal to 3 tons 9 cwt 2 qrs. 16 lb. per acre, and there is no doubt, if this cut had been made earlier another cut of almost equal weight would have been obtained.

This clover was included in the winter pasture plot referred to when discussing Subterranean clover, where it showed its superiority over the other clovers in the mixture by the manner in which it continued to grow and set seed profusely during the hot months.

The fact of its setting seed so profusely both in the pasture plot and test rows does not substantiate the opinion once held that the bumble bee was essential to successful fertilization of the flowers, though it is quite possible that the ordinary honey bee was the medium of bringing this about here. It is noticeable, however, that the flowers of the young seedlings do not set as much seed as the flowers on plants which have been established, say, one or two years.

Chilian clover grows well on the stiff class of soil found on the Farm, will withstand short periods of dry weather without serious damage, and is not harmed to any great extent by the baking of the soil under the summer sun. Furthermore, it responds rapidly to irrigation after grazing. It is a variety which should be included in all pastures.

Crimson or Red Clover (*Trifolium incarnatum*).

This variety, which is an annual, closely resembles Chilian clover in its habits of growth, being equally as quick-growing, and as large in the stools though perhaps slightly more compact. Growing best in the late winter and early spring, this clover yielded last year at the rate of 4 tons 1 qr. 12 lb per acre. It is a very strong grower, inclined to coarseness, but having a very fair percentage of succulent foliage. Both leaves and stems are covered with fine hairs, which would detract considerably from its value as a fodder plant.

The flowers, which are typical, are long, narrow and bright red in colour, and commence to form in August and September, producing seed very profusely. No trouble is experienced in harvesting the seed, but it is not easily separated from the attached covering. Judging by last year's performance, this clover appears to be quite suitable to this class of heavy soil and responds admirably to irrigation, and apart from its hairy nature has considerable value. In most countries Crimson clover is grown as a rotation crop, and the yield obtained suggests a similar use for it on the irrigation area.

Egyptian Clover or Berseem (*Trifolium alexandrinum*).

Although not given much publicity in the past, this clover is one which, as it becomes more widely known and its value recognised, is likely to play an important part in the development of the irrigation areas. As a substitute for lucerne in the manufacture of a leguminous hay for farm use, this clover might be profitably utilised.

On 28th October last, when a cut of this clover was weighed in the green state, it was found to yield 2 tons 17 cwt. 16 lb. per acre. Previous to this two other cuts had been removed without weighing, one of which was equally as dense and heavy, but the first was not so far advanced, nor so bulky. Again, a fair growth was made after the last cut, and produced a fair amount of seed. Reckoning that three cuts could be made, and this would be no difficult matter, the total amount of greenstuff per acre would be 8 tons 11 cwt. 1 qr. 20 lb. This compares favourably with wheat or barley for green feed, besides being of value as a soil renovator.

The yields obtained were the highest yet recorded at Yanco. This was possibly due to the early sowing, which allowed three cuts to be made.

The quality of this clover as a green feed is such that it would be relished by any stock, its extreme smoothness and succulence and absence of any hairiness or woody growth, making it eminently suitable for that purpose. A very high percentage of moisture is lost while drying, but the resultant hay, if stored, is suitable for feeding to any class of stock.

Egyptian clover is an annual, growing during the winter and reaching its maximum towards the end of that period. To obtain the best results it should be sown in the early autumn, say March or April—the earlier the better. It grew last year to a height of 18 inches, stooled moderately, and responded admirably to irrigation. This clover is not a heavy seeder.

Bokhara Clover (*Melilotus alba*).

Often referred to as " Sweet clover," this variety is becoming more widely known, as is evidenced by the numerous inquiries concerning it.

Last year it did not grow as well as previously, remaining dormant practically through the winter. About September, old-established plants began to make a vigorous new growth, but it did not subsequently develop into anything of special note. At the same time many young seedlings were noticeable between the rows, which had come up before irrigation commenced, apparently from seed produced the previous summer. This seems to indicate that spring is the best time for planting this clover, which is a biennial in habit.

The stems of this clover grow extremely coarse and woody unless well cut back or eaten off close to the ground. Where it spread along the banks of an adjacent channel, the sheep had access to it; they were observed to strip the leaves from the tall stalks as readily as they ate the lucerne, proving that its peculiar smell and taste does not always deter stock from eating it. Its strong, deep-rooting system, which finds its way into the stiff clay subsoil, is a very valuable factor. When it can be proved that this is a general habit of the plant, it should have a special value in opening up and preparing land for lucerne, and possibly enabling lucerne to grow on soil now considered unsuitable.

The Spineless Burr Trefoils or Medics.

GIANT BURRLESS TREFOIL (*Medicago scutillata*).—The most striking difference between this variety and the other burrless medics is in the pod formation, this being characterised by its large spiral shape forming a sphere approximating ½ inch in diameter, and containing four or five large flat yellow seeds. Though numerous, they are not as plentiful as the smaller pods of the other varieties.

This variety resembles the others in that it is vine-like, with branches up to 2 feet in length, though not so coarse, but associated with a moderate leaf growth. It is one of the hairy types, but not so bad as to render it entirely disagreeable to stock.

It was not found to germinate as well as other medics, but later, with the help of sufficient rain, made a very vigorous growth during the winter and early spring, which growth seems to indicate that it is admirably suited to this district. It is fully equal in value to any other of the burrless medics.

Medicago tuberculata.—This is also one of the useful spineless burr medics being tried here. Resembling the other varieties under trial, and likewise the common burr trefoil of our natural pastures in its general manner of growth, its seed pods differ from the burr trefoil in the absence of any harmful burr or hook.

Favoured by a fair rainfall this variety made a good growth last winter, commencing about April and lasting well into October, when it was cut and an acre-yield computed, working out at 5 tons 10 cwt. 2 qrs. 24 lb.

Although the trefoil carries a fair percentage of leaf, of a succulent though somewhat hairy character, most of the weight is represented by the long vine-like woody stems, which grew up to 3 feet in length. It is a prolific seed-producing variety, and on this account would be extremely useful if it could be incorporated in our natural pastures with the hope of supplanting the troublesome burr variety.

OTHER SPINELESS BURR MEDICS.—The other medics under trial, viz., *Medicago hispida*, *M. hispida sardoa*, *M. hispida confinis*, and *M. hispida reticulata*, were sown conjointly in one plot, where their similarity made distinguishing between varieties most difficult. They are mostly small, smooth-leaved varieties, but all develop a strong woody stem growth as they mature, losing therewith a large amount of leaf. Under grazing this feature would not be so pronounced.

Last winter, in unison with the other clovers, they grew exceedingly well, forming a mass of greenstuff 18 inches deep over the plot. This in the young stages was quite soft and succulent, and being of a leguminous nature was very nutritious. The weights are not available, but these as a whole should compare favourably with the two varieties previously mentioned.

The chief value of these medics is in the seed-carrying pods being quite free from any harmful burr, and apart from their high feeding value, are decidedly superior to the too well-known burr clovers in this respect. The benefits to be derived from the cultivation and dissemination of these useful medics in our pastures cannot be overestimated, if they will in any way assist in reducing the burr trouble in the wool industry.

VINEYARD NOTES FOR MAY.

THE marketing of late table grapes from outlying districts brings the 1919 vintage to a conclusion, and on the whole it has been a satisfactory one. This is particularly so in the case of table fruit, for in some of the wine areas the conditions were too dry for a heavy yield of wine. The general absence of rain, and consequently of diseases, rendered the handling of table grapes an easy matter. In the County of Cumberland there was but little necessity for trimming, and consequently packing could be done quickly and well.

As mentioned last month, Downy Mildew made its appearance in many places after the late February rains, and though too late to do serious damage, it should serve to impress upon growers the need for constant care in the future. In one instance the disease appeared while vintage was in progress, and in the course of a week it completely defoliated the vines. Under the circumstances, owing to development being so rapid, spraying was out of the question.

From many sources the information is obtained that, even though general evidence of disease was absent, sprayed vineyards were healthier than unsprayed. This bears out the evidence of European growers that sprayed vines are always more healthy and hold their leaves longer than unsprayed ones, and when this is so, as pointed out two months ago, there is a better maturing of the wood which is to supply the following season's crop.

In early districts pruning will be started, and all winter operations in the vineyard will be under consideration.

During the past few months vignerons have realised, as never before, that the starling is a factor to be considered in the future. The prevailing drought conditions have complicated matters by accentuating the shortage of food in the outside areas. As a result, wherever fruit is grown the same tale of destruction by starlings is told. What the rabbit is to the farmer the starling is to the vinegrower, only worse. A farm can be netted against rabbits, but there is no way of excluding the starling from the orchard or vineyard. It is a case for united action. Destroy the bird wherever possible and by any means possible. At their rate of multiplication, fruit-growing will become an impossibility in a few years. They breed twice in a season, and each brood ranges up to five young ones. They are difficult to shoot and hard to poison, and there would appear to be but one remedy—that of prevention of increase by destroying nests, eggs, and young birds. Householders not directly interested rarely move to eradicate the starling, but he is a filthy, vermin-infested individual, unfit to receive any consideration.—H. E. LAFFER, Viticultural Expert.

Egg-laying Tests at Hawkesbury Agricultural College.

(**Under the Supervision of James Hadlington, Poultry Expert.**)

SEVENTEENTH YEAR'S RESULTS, 1918–19.

E. F. WHITBREAD, Organising Secretary.

THE Seventeenth Annual Egg-laying Competition concluded on the 31st March last, and marked the third year of wholly single-pen testing at the Hawkesbury Agricultural College. The results are interesting, though on the whole the egg production has not been as good as in the previous two competitions. The average to the credit of the 420 birds in the First-year Sections, although not up to the averages of the past two years, had not been equalled in any other year. The laying of the light breeds in the Second-year Section was about equal to the previous year, and the heavy breeds put up figures in excess of the previous test.

In the light breeds' First-year Section for the months of April, May, June and July, a falling off was exhibited as compared with the corresponding months of the previous year, while almost the reverse was the case with the heavy breeds. Thus, in the early stages of the competition there was some justification for entertaining the hope that the final figures would probably be equal to those of the previous test. However, experience has shown that in all classes of competitions fluctuations must be expected, and the slight decrease exhibited in the averages should serve only to encourage greater effort on the part of all concerned towards improved production.

The most important items in connection with the competition are (1) the excellent laying of the heavy breeds in the two-years' test, following upon the good performance in the first year; (2) the high tally of Mr. C. Judson's Black Orpingtons in the two-years' test; and (3) the fine score of Mr. A. Drayton's Black Orpington hen No. 251 in the First-year Section (heavy breeds), which is a record for the Hawkesbury College Competitions.

A matter of interest that should be mentioned is the better averages of the Black Orpingtons, Silver Wyandottes and Langshans, as compared with those of the Rhode Island Reds, Plymouth Rocks and Buff Orpingtons, the latter breeds having materially affected the average laying of the heavy breeds' section. In the light breeds' section, while the thirty-nine groups of White Leghorns put up an average of 200 eggs per hen, the one group of Minorcas averaged only 172 eggs per bird, and the average for the section was consequently reduced to 199.

The first question raised in our minds when the results of the year's work (good or indifferent) are available is : "What were the contributing factors?" In the period under review the birds have received exactly the same treatment, feeding, &c., as in previous years, in accordance with the recommendations of the Poultry Expert, and it is therefore reasonable to assume that the lower averages have not been influenced by anything that might come under this heading. Apart from the above reference to the performances of the different breeds, the decline may be partly attributed to other causes, perhaps to some extent to the severe winter followed by droughty conditions in the spring and summer months, or perhaps to the fact, strongly emphasised by Mr. Hadlington at last year's Poultry Farmers' Conference, that a large percentage of the birds in the competition were of a very poor type. That

A

B

Mr. C. Judson's Black Orpingtons.

Winners of the Grand Champion Prize for greatest number of eggs laid by group of six birds in two years, without replacement (2,789 eggs). The pen also won first prize for greatest number of eggs in second twelve months in heavy breeds section.

A.—This is hen No. 500, winner of first prize for greatest number of eggs in second year (individual hens) in heavy breeds section.

B.—This is hen No. 502, which won the Grand Champion Prize for greatest number of eggs laid by individual hen during two years (533 eggs).

statement was based on the Poultry Expert's inspection of the birds at the commencement of the competition; and a glance at the returns will show that his prophecy has materialised, as there has been a falling off in the laying of both the light and heavy breeds in the First-year Section, whereas in the Second-year Test the average of the light breeds has been maintained, and that of the heavy breeds exceeds the figure for the previous year. Considering these results, it would appear that the second factor suggested as being a probable cause of the falling off in the averages of the first-year hens is feasible.

Commencing with the forthcoming competition it has been decided to abandon the second-year tests. In arriving at this decision the Committee was prompted by the fact that the data on hand from the twelve years' tests indicated that steady improvement had taken place in the second year's laying, corresponding with the improved averages for the first year, thus showing that the latter had not taken place at the expense of the second year's production.

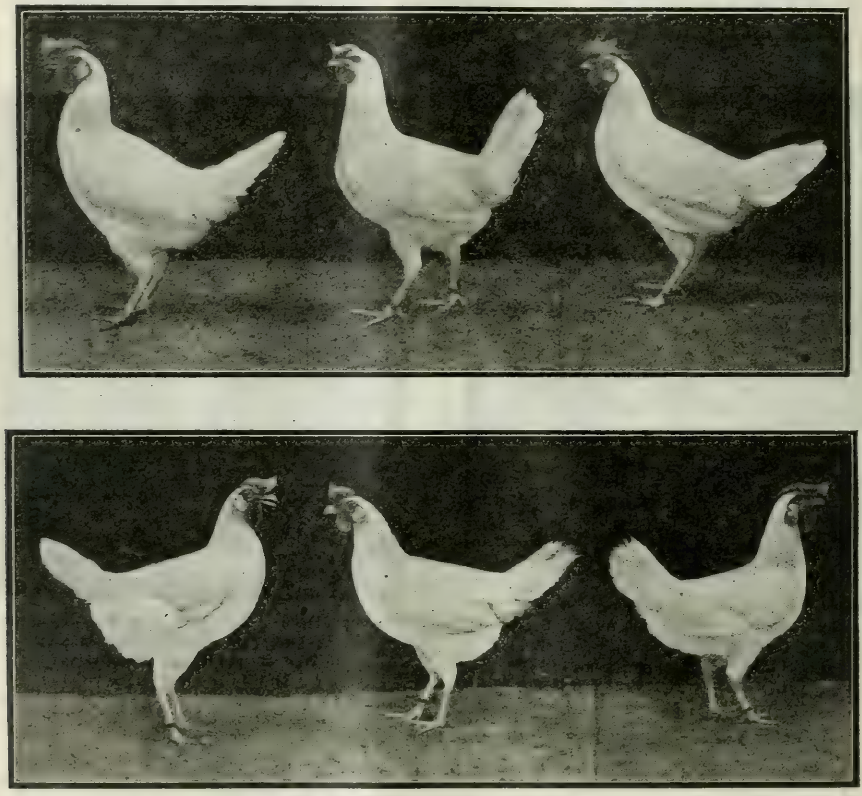
Trophy valued at £5 5s., won by Mr. C. Judson (Black Orpingtons) for the greatest number of eggs laid by a group of six birds in two years without replacement of a bird.

Trophy valued at £3 3s., won by Mr. C. Judson (Black Orpington hen) for the greatest number of eggs laid by an individual bird during two years.

There has been a heavy demand each year from prospective competitors for admission of their birds to the competition, and the Committee of Management took the opportunity of increasing the number of pens available for testing first-year birds in the 1919–1920 Competition, while at the same time instituting a new idea in the form of a separate section for "Standard" birds, that is to say, for competitors keeping a breed with which they have secured a first, second, or third prize at an approved exhibition in New South Wales during the past three years. The results from these birds will, no doubt, be watched with considerable interest, and should the innovation justify itself, poultry farmers will learn that egg-production can be maintained in conjunction with the preservation of character and type.

Second-year Hens.

The excellent performance in the previous year of Mr. C. Judson's group of six Black Orpingtons, which laid 1,613 eggs in their first year, opened up the possibility of a record for the two-years' test at the College. This has been achieved, as the birds laid 1,176 eggs in their second year, making a total of 2,789 eggs, of a record value of £15 8s. 2d. for the two years, and easily eclipsing the highest figures of the past. Previously the highest value of eggs for two years' laying was £15 0s. 11¾d., which stood to the credit of Mr. J. M. Weaver's White Leghorns. One of Mr. Judson's hens (No. 502) laid 533 eggs in the two years—also the best performance in the tests at the College.



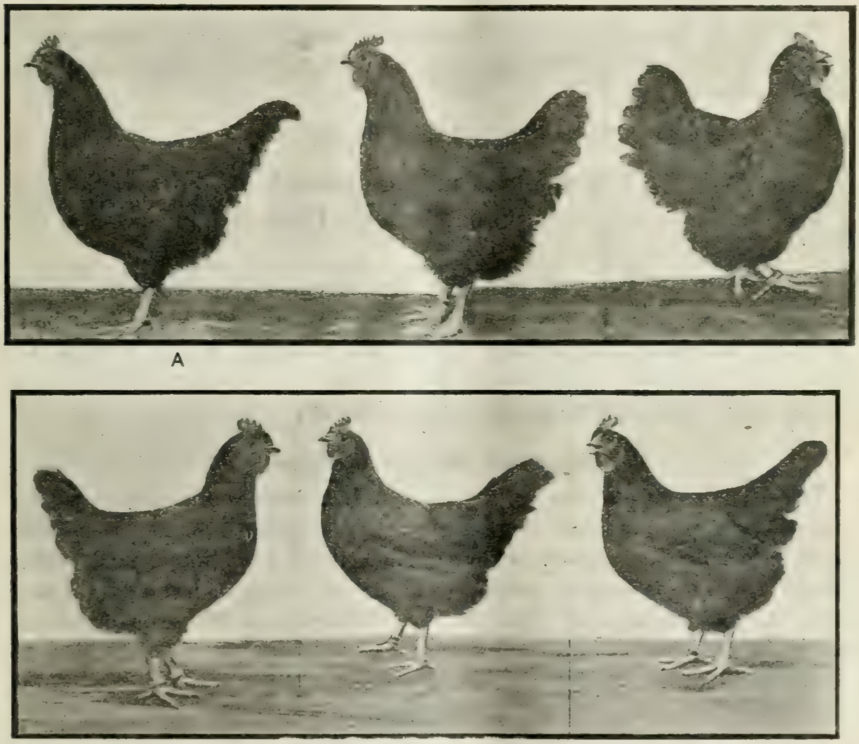
Mr. M. McInnes' White Leghorns.

Winning pen in Seventeenth Annual Competition (1,448 eggs) in light breeds section.

Mr. Judson thus won the two trophies illustrated on page 339, the larger one, valued at £5 5s., for "the greatest number of eggs laid by a group of six birds in two years without replacement of a bird," and the smaller cup, valued at £3 3s., for "the greatest number of eggs laid by an individual bird during two years."

The averages for first and second years respectively were 231 and 162 (light breeds), and 222 and 150 (heavy breeds).

The previous best average for the light and heavy breeds combined was in the last test, viz., 226 and 147 for the first and second years respectively, but this has been passed in the test just concluded, the figures being 227 and 156.



Mr. A. Drayton's Black Orpingtons.

Greatest number of eggs in Seventeenth Annual Competition (1,517 eggs) in heavy breeds section.

A.—This is hen 501, winner of first prize for greatest number of eggs (individual hens) in heavy breeds section (324 eggs).

First-year Sections.

Section A. (Light Breeds.)

As already mentioned, the laying in this section was not as good as in recent years. The average per bird was 199 eggs, which has been beaten in the previous two tests, though in those years only.

The highest total in this section was 1,448 eggs, laid by Mr. McInnes' group of six White Leghorns, the value being £8 8s. 3d. Two groups in this section failed to lay 1,000 eggs, as against one group last year.

SECTION B. (HEAVY BREEDS.)

The average in this section was 189 eggs per bird. The leading group (Mr. A. Drayton's Black Orpingtons) laid 1,517 eggs, valued at £9 3s. 6¾d. This has only been exceeded by heavy breeds in one previous test. Hen No. 251 laid 324 eggs, with an average of over 24 oz. to the dozen. The previous highest record in the College competitions was 312 eggs, that number being laid by two birds, one belonging to Mr. P. C. McDonnell and the other to Mr. C. Judson.

Mr. W. H. Forsyth's Silver Wyandottes, besides securing fourth place, included a bird that laid 295 eggs, which is a record for a single hen of the breed at the College.

Only five groups in this section laid less than 1,000 eggs.

Committee of Management.

The names of the gentlemen comprising the Committee in control of the competition are as follows:—

Principal H. W. Potts (Hawkesbury Agricultural College), Messrs. James Hadlington (Poultry Expert, Department of Agriculture), A. L. Wyndham (Poultry Instructor, Hawkesbury Agricultural College), W. H. Forsyth, G. White, A. E. Brown (Competitors' Representatives), and E. F. Whitbread (Department of Agriculture), Organising Secretary.

Minimum Weight of Eggs.

The regulation governing the weight of eggs differed in this from previous competitions, in so far that the eggs from the individual birds now require to be at least 2 oz. each, otherwise they are ineligible for individual prizes. The groups of six birds have to attain 24 oz. per dozen eggs as formerly, or they suffer disqualification from group prizes. Particulars of the disqualifications are given below.

Disqualified from Individual Prizes.

Second-year Hens.

Light Breeds.—L. Bulluss (No. 429); W. Maskell (No. 460); A. Duffield (No. 447); Mrs. G. Reed (No. 466)—all White Leghorns.

Heavy Breeds.—H. Bastin, Langshan (No. 526); J. T. Brett, Black Orpington (Nos. 484 and 486).

First-year Hens.

Light Breeds.—H. G. Burris (No. 31); D. Chrystal (No. 49); A. Greentree (Nos. 89 and 90); T. Partridge (No. 112); W. H. Hampton (No. 120); Brundah Poultry Farm (No. 141); Willow Grange Poultry Farm (No. 218); R. Whitelaw (No. 232)—all White Leghorns.

Heavy Breeds.—Fetherston Bros., Black Orpington (No. 257); Gillies Bros., Black Orpington (No. 261); Mrs. W. V. Hopkins, Black Orpington (No. 279); Pert and Dunn, Langshan (No. 337); D. A. Mobbs, Silver Wyandotte (No. 370); Exchange Poultry Farm, Silver Wyandotte (No. 374); J. England, Buff Orpington (No. 380); J. F. Dalrymple, Rhode Island Red (No. 387); R. M. Griffiths, Rhode Island Red (No. 395); A. Tye, Rhode Island Red (No. 403).

Disqualified from Group Prizes.

First-year Hens.

Light Breeds.—Nil.

Heavy Breeds.—Exchange Poultry Farm, Silver Wyandottes (Nos. 373 to 378).

The birds ineligible for individual prizes on account of their eggs not weighing 2 oz. are indicated by a reference note at the foot of the different tables of results.

Mortality and Disease.

Although the total number of deaths and replacements was slightly larger than the previous year, the number of deaths was not exceptional, amounting to only 5½ per cent. of the competing birds. It will be noticed from the appended table that there was a fair number of replacements within three months of the commencement of the competition.

	Birds replaced.		Birds not replaced.
	Deaths.	Sickness or other causes	Deaths.
First Year—			
Section A (Light breeds)	1	6	12
,, B (Heavy breeds)	1	5	10
Second Year—			
Section D (Light breeds)	...	...	5
,, E (Heavy breeds)	...	...	3

The Financial Aspect.

The total cost of feed for the 540 birds in the first and second-year sections was £205 8s. 8d., or an average of, say, 7s. 7d. After deduction of freight and other charges, the net value of the eggs was £564 5s. 10¾d., the balance being £358 17s. 2¾d., which is equal to 13s. 3½d. per hen over and above the cost of feed.

For the purposes of comparison, the cost of feeding has been estimated as follows :—

Second year, Sections D and E	6s. 8d. per hen.
First year, Sections A and B	7s. 10d. per hen.

Second-year Hens.

Section D—Light breeds.—Market value of eggs laid, £51 0s. 8½d., less cost of feed, £20, leaving a balance of £31 0s. 8½d., or 10s. 4d. per hen.

Section E—Heavy breeds.—Market value of eggs laid, £51 3s. 2¼d., less cost of feed, £20, leaving a balance of £31 3s. 2¼d., or 10s. 4½d. per hen.

FIRST-YEAR HENS.

Section A—Light breeds.—Market value of eggs laid, £264 13s. 1½d., less cost of feed, £94, leaving a balance of £170 13s. 1½d., or 14s. 2½d. per hen.

Section B—Heavy breeds.—Market value of eggs laid, £197 8s. 10½d., less cost of feed, £70 10s., leaving a balance of £126 18s. 10½d., or 14s. 1¼d. per hen.

AWARDS OF PRIZES AND CERTIFICATES.

Subjoined is a list of the prizes and certificates won by the various competitors.

The qualification for a certificate was that the group of six birds must have laid (*a*) 1,300 eggs in the first year, or (*b*) 2,250 eggs in the two years.

Two Years' Test.

GRAND CHAMPION PRIZES.

Greatest number of eggs laid by group of six birds during two years without replacement of a bird. Prize £5 5s. (or trophy of that value)—C. Judson, Black Orpingtons (birds Nos. 499 to 504).

Greatest number of eggs laid by individual hen during two years. Prize £3 3s. (or trophy of that value)—C. Judson, Black Orpington (hen No. 502).

CERTIFICATES.

C. Leach, A. Duffield, Mrs. M. Chalmers, W. H. Cole, Mrs. G. Reed, S. P. Simmons (all White Leghorns); C. Judson (Black Orpingtons); E. F. Silcock (Silver Wyandottes).

A

Mr. C. Leach's White Leghorns.

Greatest number of eggs in two years (groups of six birds) in light breeds section (2,567 eggs).

A.—This is hen No. 453, which won first prize for greatest number of eggs (235) in second twelve months (individual hens) in light breeds section.

SECTION D—LIGHT BREEDS.

Greatest number of eggs in second twelve months (groups of six birds). Prizes, £1 and 10s.—A. Duffield, White Leghorns, 1,166 eggs (1); C. Leach, White Leghorns, 1,104 eggs (2).

Greatest number of eggs in second twelve months (individual hens). Prizes, £1 and 10s. —C. Leach, White Leghorn (hen No. 453), 233 eggs (1); W. Maskell, White Leghorn (hen No. 462), 224 eggs (2).

Greatest number of eggs in two years (groups of six birds). Prizes, £2 and £1.—C. Leach, White Leghorns, 2,567 eggs (1); A. Duffield, White Leghorns, 2,544 eggs (2).

Greatest number of eggs in two years (individual hens). Prizes, £1 and 10s.—W. Maskell, White Leghorn (No. 462), 487 eggs (1); C. Leach, White Leghorn (No. 453), 486 eggs (2).

Highest averages for two years (groups of six or five birds). Prizes, £2, £1 10s., and £1. —W. Maskell, White Leghorns, 428 (five birds) (1); C. Leach, White Leghorns, 427 (six birds) (2); A. Duffield, White Leghorns, 424 (six birds) (3).

Quarterly prizes (groups of six birds) :—

- 1st April to 30th June, 1918. Prizes, £1 and 10s.—C. Leach, White Leghorns, 203 eggs (1); A. Duffield, White Leghorns, 141 eggs (2).
- 1st July to 30th September, 1918. Prizes, £1 and 10s.—A. Duffield, White Leghorns, 353 eggs (1); C. Leach, White Leghorns, 335 eggs (2).
- 1st October to 31st December, 1918. Prizes, £1 and 10s.—S. P. Simmons, White Leghorns, 414 eggs (1); Mrs. G. Reed, White Leghorns, 370 eggs (2).
- 1st January to 31st March, 1919. Prizes, £1 and 10s.—A. Duffield, White Leghorns, 310 eggs (1); Mrs. G. Reed, White Leghorns, 280 eggs (2).

SECTION E—HEAVY BREEDS.

Greatest number of eggs in second twelve months (groups of six birds). Prizes, £1 and 10s.—C. Judson, Black Orpingtons, 1,176 eggs (1); E. F. Silcock, Silver Wyandottes, 1,143 eggs (2).

Greatest number of eggs in second twelve months (individual hens). Prizes, £1 and 10s.—C. Judson, Black Orpington (No. 500), 244 eggs (1); E. F. Silcock, Silver Wyandotte (No. 530), 236 eggs (2).

Greatest number of eggs in two years (groups of six birds). Prizes, £2 and £1.—C. Judson, Black Orpingtons, 2,789 eggs (1); E. F. Silcock, Silver Wyandottes, 2,513 eggs (2).

Greatest number of eggs in two years (individual hens). Prizes, £1 and 10s.—C. Judson, Black Orpington (No. 502), 533 eggs (1); G. Hopping, Black Orpington (No. 496), 500 eggs (2).

Highest average for two years (groups of six or five birds). Prizes, £2, £1 10s., and £1.—C. Judson, Black Orpingtons, 464 eggs (six birds) (1); E. F. Silcock, Silver Wyandottes, 418 eggs (six birds) (2); G. Hopping, Black Orpingtons, 393 eggs (five birds) (3).

Quarterly prizes (groups of six birds) :—

- 1st April to 30th June, 1918. Prizes, £1 and 10s.—E. F. Silcock, Silver Wyandottes, 284 eggs (1); C. Judson, Black Orpingtons, 280 eggs (2).
- 1st July to 30th September, 1918. Prizes, £1 and 10s.—C. Judson, Black Orpingtons, 366 eggs (1); E. F. Silcock, Silver Wyandottes, 330 eggs (2).
- 1st October to 31st December, 1918. Prizes, £1 and 10s.—C. Judson, Black Orpingtons, 328 eggs (1); E. F. Silcock, Silver Wyandottes, 316 eggs (2).
- 1st January to 31st March, 1919. Prizes, £1 and 10s.—J. T. Brett, Black Orpingtons, 237 eggs (1); J. Roberts, Black Orpingtons, 222 eggs (2).

Seventeenth Annual Competition.

CERTIFICATES.

M. McInnes, P. Newman, R. Whitelaw, L. K. Pettit, J. J. Vaughan, A. J. Heaver, C. C. Kennett, W. E. Webster, W. R. Hulks, F. L. Parker (all White Leghorns); also A. Drayton and Mrs. W. V. Hopkins (Black Orpingtons); A. E. Brown (Langshans); and W. H. Forsyth (Silver Wyandottes).

SECTION A—LIGHT BREEDS.

Greatest number of eggs in twelve months (groups of six birds). Prizes, £2, £1 10s., £1, and 10s.—M. McInnes, White Leghorns, 1,448 eggs (1); P. Newman, White Leghorns, 1,423 eggs (2); R. Whitelaw, White Leghorns, 1,406 eggs (3); L. K. Pettit, White Leghorns, 1,383 eggs (4).

Greatest number of eggs in twelve months (individual hens). Prizes, £2 10s., £2, £1 10s., £1, and 10s.—W. I. Baker, White Leghorn (No. 17), 277 eggs (1); W. R. Hulks, White Leghorn (No. 12), 273 eggs (2); B. Clarke, White Leghorn (No. 58), 269 eggs (3); R. Whitelaw, White Leghorn (No. 230) 267 eggs (4); J. L. Hunt, White Leghorn (No. 127), 264 eggs (5).

Highest averages for twelve months (groups of six or five birds). Prizes, £2 10s., £2, £1 10s., and £1.—W. R. Hulks, White Leghorns, 244 eggs (five birds) (1); M. McInnes, White Leghorns, 241 eggs (six birds) (2); P. Newman, White Leghorns, 237 eggs (six birds) (3); R. Whitelaw, White Leghorns, 234 eggs (six birds) (4).

Quality Prizes.—Ten groups conforming most closely to standard type were selected to compete for prizes of £1 10s. and £1. It was stipulated that no prize would be awarded to any group laying less than 1,100 eggs.—J. J. Vaughan, White Leghorns, 1,368 eggs (1); C. C. Kennett, White Leghorns, 1,349 eggs (2).

Quarterly prizes (groups of six birds) :—

1st April to 30th June, 1918. Prizes, £1 10s. and £1.—R. Whitelaw, White Leghorns, 316 eggs (1); C. C. Kennett, White Leghorns, 312 eggs (2).

1st July to 30th September, 1918. Prizes, £1 and 10s.—W. E. Webster, White Leghorns, 421 eggs (1); J. J. Vaughan, White Leghorns, 415 eggs (2).

1st October to 31st December, 1918. Prizes, £1 and 10s.—J. J. Vaughan, White Leghorns, 438 eggs (1); W. E. Webster, White Leghorns, 434 eggs (2).

1st January to 31st March, 1919. Prizes, £1 10s. and £1.—W. E. Webster, White Leghorns, 352 eggs (1); J. J. Vaughan, White Leghorns, 349 eggs (2).

SECTION B—HEAVY BREEDS.

Greatest number of eggs in twelve months (group of six birds). Prizes, £2, £1 10s., £1, and 10s.—A. Drayton, Black Orpingtons, 1,517 eggs (1); A. E. Brown, Langshans, 1,441 eggs (2); Mrs. W. V. Hopkins, Black Orpingtons, 1,395 eggs (3); W. H. Forsyth, Silver Wyandottes, 1,346 eggs (4).

Greatest number of eggs in twelve months (individual hens). Prizes, £2 10s., £2, £1 10s., £1, and 10s.—A. Drayton, Black Orpington (No. 251), 324 eggs (1); W. H. Forsyth, Silver Wyandotte (No. 354), 295 eggs (2); A. E. Brown, Langshan (No. 336), 287 eggs (3); G. E. Holmes, Black Orpington (No. 276), 279 eggs (4); G. Gurney, Silver Wyandotte (No. 355), 268 eggs (5).

Mr. W. I. Baker's White Leghorn.
Greatest number of eggs (277) in Seventeenth Annual Competition (individual hens), in light breeds.

Mr. A. E. Brown's Langshan.
Laid 287 eggs in twelve months in Seventeenth Annual Competition.

Highest averages for twelve months (groups of six or five birds). Prizes, £2 10s., £2, £1 10s., and £1.—A. Drayton, Black Orpingtons, 252 eggs (six birds) (1); E. J. Kinney, Silver Wyandottes, 241 eggs (five birds) (2); A. E. Brown, Langshans, 240 eggs (six birds) (3); Mrs. W. V. Hopkins, Black Orpingtons, 232 eggs (six birds) (4).

Quality Prizes.—Ten groups conforming most closely to standard type were selected to compete for prizes of £1 10s. and £1. It was stipulated that no prize would be awarded to any group laying less than 1,100 eggs.—Pert and Dunn, Langshans, 1,298 eggs (1); S. W. Rutherford, Langshans, 1,219 eggs (2).

Quarterly prizes (groups of six birds) :—

1st April to 30th June, 1918. Prizes, £1 10s. and £1.—A. Drayton, Black Orpingtons, 399 eggs (1); A. E. Brown, Langshans, 359 eggs (2).

1st July to 30th September, 1918. Prizes, £1 and 10s.—Pert and Dunn, Langshans, 441 eggs (1); A. E. Brown, Langshans, 425 eggs (2).

1st October to 31st December, 1918. Prizes, £1 and 10s.—Mrs. W. V. Hopkins, Black Orpingtons, 393 eggs (1); A. Drayton, Black Orpingtons, 378 eggs (2).

1st January to 31st March, 1919. Prizes, £1 10s. and £1.—A. Drayton, Black Orpingtons, 321 eggs (1); Mrs. W. V. Hopkins, Black Orpingtons, 308 eggs (2).

COMPARISON OF RESULTS.

The following tables analyse the results of the whole series:—

SECOND-YEAR HENS.

No. of Competition.		No. of Pens.	Highest total, two years.	Highest total, second year.	Average per hen, first year.	Average per hen, second year.	Balance over feed per hen, first year.		Balance over feed per hen, second year.		Greatest value of eggs per hen, two years.		
							s.	d.	s.	d.	£	s.	d.
1st		40	2,487	1,054	180	124	11	2	6	0½	12	1	6
2nd		50	2,634	1,150	179	127	10	11	5	4¾	12	16	9
3rd		40	2,319	1,013	190	140	11	4	9	8	13	2	5
4th		40	2,369	1,045	194	134	16	9	5	8	12	14	2
5th		30	2,372	1,110	184	140	10	2	8	3	12	2	2
6th		30	2,373	1,028	201	135	14	4	6	11	12	11	7
7th		30	2,552	1,091	194	145	14	0	7	6	13	12	3
8th		28	2,421	1,156	190	158	13	7	9	2	12	1	8
9th		29	2,572	1,213	201	161	13	1½	11	6	14	5	2
10th		20	2,647	1,231	213	165	17	1	11	3	15	0	11¾
11th	D	10	2,672	1,146	241	164	20	2½	9	1¼	14	4	2½
	E	10	2,244	929	210	131	17	0¾	6	3	12	8	10¼
12th	D	10	2,567	1,166	231	162	16	10	10	4	13	19	4
	E	10	2,789	1,176	222	150	16	1½	10	4½	15	8	2

	Eggs per Hen.		Value per Hen.	
	First Year.	Second Year.	First Year.	Second Year.
Section D—(Light breeds).			£ s. d.	£ s. d.
60 White Leghorns	231·7	162·4	1 4 6	0 17 0
Section E—(Heavy breeds).				
42 Black Orpingtons...	225·4	146·1	1 4 2	0 16 5¼
12 Silver Wyandottes	216·5	171·1	1 3 0	1 0 3¾
6 Langshans	213·5	139·3	1 2 11	0 14 9¾

ANNUAL COMPETITION.

		No. of Groups.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Greatest Value.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Balance over Feed.
1st		38	1,113	459	137	130	140/-	1/1	15/6	6/-	9/6
2nd		70	1,308	666	160	163	150/-	1/3¾	17/9	5/9¾	12/-
3rd		100	1,224	532	154	152	114/-	1/-	12/9	4/5½	8/3
4th		100	1,411	635	168	166	125/-	-/11½	13/3	5/3½	8/-
5th		100	1,481	721	162	171	137/-	1/0½	14/10	5/10	9/-
6th		60	1,474	665	161	173	149/-	1/2¼	17/2	7/-	10/2
7th		50	1,379	656	159	180	146/-	1/3¼	19/2	7/9½	11/4
8th		60	1,394	739	158	181	173/-	1/5¼	21/9	6/9	15/-
9th		40	1,321	658	151	168	134/5	1/2	16/3½	6/5½	10/2
10th		50	1,389	687	146	184	141/9	1/2½	18/5½	6/1½	12/4
11th		50	1,461	603	156	178	164/7	1/3½	19/4¼	7/3½	12/0¾
12th		50	1,360	724	152	177	145/3	1/2½	17/7	5/9	11/10
13th		63	1,541	705	162	181	152/9	1/2	17/8½	6/9½	10/11
14th		70	1,449	506	165	192	172/7	1/4½	22/2	7/7	14/7
15th	A	40	1,526	924	162	216	171/11	1/3¾	23/8¾	6/10	16/10¾
	B	30	1,479	749	165	192	171/3	1/3¾	21/7½	6/10	14/9½
16th	A	40	1,525	923	157	209	166/2¼	1/4	21/9¾	7/8	14/1¾
	B	30	1,613	931	170	202	172/3¼	1/4	21/2	7/8	13/6
17th	A	40	1,448	860	153	199	168/3	1/5½	22/0½	7/10	14/2½
	B	30	1,517	815	151	189	183/6¾	1/5½	21/11¼	7/10	14/1¼

ANNUAL COMPETITION—*continued.*

	Eggs per Hen.	Value per Hen.
Section A.		£ s. d.
234 White Leghorns	200·1	1 2 1¼
6 Minorcas	172·1	0 19 7½
Section B.		
84 Black Orpingtons	194·8	1 2 5½
30 Silver Wyandottes	203·4	1 4 2
24 Langshans	208·5	1 4 2
24 Rhode Island Reds... ...	156·0	0 17 4¼
12 Plymouth Rocks	162 6	0 18 3
6 Buff Orpingtons	169·6	1 0 0¼

Monthly Scores of Leading Birds.

The following are the individual monthly scores of the leading ten hens in Sections A and B, and of the leading five hens in Sections D and E :—

Owner and Breed.	Hen No.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	February.	March.	Total.
FIRST YEAR.														
Section A—Light Breeds.														
R. Whitelaw : White Leghorn ...	232	22	26	24	27	25	27	26	24	22	23	19	17	282*
W. I. Baker : White Leghorn... ...	17	15	21	21	24	26	28	29	25	26	23	19	20	277
W. R. Hulks : White Leghorn ...	12	19	21	22	22	24	28	23	23	26	26	19	20	273
B. Clarke : White Leghorn	58	17	20	21	22	23	26	25	26	26	23	19	21	269
R. Whitelaw : White Leghorn ...	230	3	25	23	24	23	28	27	26	28	23	20	17	267
J. L. Hunt : White Leghorn	127	11	21	20	24	24	26	27	28	26	22	12	23	264
L. K. Pettit : White Leghorn... ...	181	22	24	20	21	23	25	23	23	22	24	19	17	263
T. E. Jarman : White Leghorn ...	134	13	20	23	23	23	26	27	21	24	25	19	19	263
M. McInnes : White Leghorn	158	19	22	20	20	23	25	25	24	24	21	18	21	262
L. K. Pettit : White Leghorn... ...	185	8	21	21	23	23	25	26	25	24	24	18	21	259
Section B—Heavy Breeds.														
A. Drayton : Black Orpington ...	251	28	25	27	30	29	29	31	23	28	25	21	28	324
W. H. Forsyth : Silver Wyandotte ...	354	19	23	24	27	27	29	28	26	25	21	22	24	295
A. E. Brown : Langshan	336	19	27	26	28	30	29	26	26	11	24	15	26	287
G. E. Holmes : Black Orpington ...	276	23	24	23	25	25	25	29	18	27	20	16	24	279
Mrs. W. V. Hopkins : Black Orpington	279	24	12	12	28	26	26	30	17	28	28	23	24	278*
G. Gurney : Silver Wyandotte ...	355	22	23	23	23	25	26	29	18	14	23	20	22	268
E. J. Kinney : Silver Wyandotte ...	361	19	20	21	22	23	23	23	24	24	24	20	22	265
L. Jones : Black Orpington	290	23	26	25	24	28	26	25	20	18	12	14	23	264
A. E. Brown : Langshan	335	21	25	24	25	24	25	25	15	24	15	16	22	261
A. Drayton : Black Orpington ...	250	22	21	21	19	19	24	26	23	24	24	18	20	261
Mrs. W. V. Hopkins : Black Orpington	282	21	23	19	22	23	26	27	24	24	23	10	19	261
SECOND YEAR.														
Section D—Light Breeds.														
C. Leach : White Leghorn	453	19	20	11	16	22	22	23	22	19	22	16	21	233
W. Maskell : White Leghorn	462	6	0	4	24	22	26	24	27	22	27	20	22	*224
" Bella Vista " P. Farm : W. Leghorn	426	8	0	19	18	20	24	20	21	22	21	18	14	205
Mrs. G. Reed : White Leghorn ...	463	0	10	19	17	19	20	23	22	23	22	14	16	205
C. Leach : White Leghorn	452	7	0	16	19	21	25	23	18	21	19	18	18	205
Section E—Heavy Breeds.														
C. Judson : Black Orpington	500	26	23	18	20	23	26	24	18	18	19	11	18	244
E. F. Silcock : Silver Wyandotte ...	530	20	21	18	20	19	20	23	20	23	19	13	20	236
G. Hopping : Black Orpington ...	496	23	23	21	20	19	26	26	15	16	17	11	13	230
C. Judson : Black Orpington	502	23	25	22	19	25	24	26	21	9	9	14	4	221
E. F. Silcock : Silver Wyandotte ...	529	23	23	19	20	21	19	19	17	23	18	3	9	214

* Ineligible for individual prizes—eggs under weight.

THE MONTHLY LAYING.

Month.	Second-year Test.		First-year Test.			
			Section A.		Section B.	
	Total for 120 hens.	Average per hen.	Total for 240 hens.	Average per hen.	Total for 180 hens.	Average per hen.
April, 1918	1,168	9·7	1,786	7·4	1,896	10·5
May, ,,	653	5·4	3,139	13·0	2,654	14·7
June, ,,	1,137	9·4	3,574	14·8	3,098	17·2
July, ,,	1,559	12·9	4,265	17·7	3,560	19·7
August, ,,	1,940	16·1	4,936	20·5	3,678	20·4
September, ,,	2,252	18·7	5,306	22·1	3,744	20·8
October, ,,	2,204	18·3	5,270	21·9	3,554	19·7
November, ,,	1,868	15·5	4,811	20·4	2,712	15·0
December, ,,	1,807	15·0	4,712	19·6	2,717	15·0
January, 1919	1,777	14·8	4,418	18·4	2,537	14·0
February, ,,	1,268	10·5	2,963	12·3	1,874	10·4
March, ,,	1,143	9·5	2,680	11·1	2,164	12·0
Totals	18,776	156·8	47,860	199·2	34,188	189·4

Mr. W. Maskell's White Leghorn.

Greatest number of eggs (487) in two years (individual hens) in light breeds section.

Mr. W. H. Forsyth's Silver Wyandotte.

Winner of second prize for number of eggs (295) in Seventeenth Annual Competition (individual hens), in heavy breeds.

THE POULTRY EXPERT'S REVIEW.

While the competition of 1918–19 has put up three records for the tests at Hawkesbury Agricultural College, viz., first-year single hen with 324 eggs, two-year hen with 533 eggs, and the best performance for a group in the two years, it has nevertheless slipped back as compared with the general average attained during the two preceding competitions. This is regrettable, because even the highest general average yet attained, that of last year (206), is still below what I consider to be possible. How far the weather conditions that have prevailed during the tests have contributed to this result cannot, of course, be determined. Certainly a long, cold, dry winter, followed by a droughty spring and summer, is not conducive to the best performance in egg production. As far as can be ascertained, poultry farmers have themselves experienced a somewhat similar year in regard to laying; but the circumstances are not exactly alike, for while the average poultry farmer has suffered to a very large extent from the lack of greenstuff, the competition birds have had their regular supply, though perhaps not of the same quality as in a good season. I am not, therefore, inclined to attribute all the falling off in this competition to weather conditions, but rather think a good deal is due to the birds themselves.

It is a significant fact that while the general average of the first-year hens has declined eleven eggs, the general average for the two-year hens has increased by nine eggs. It will be remembered that at the commencement of this test I expressed myself as not sanguine that a good general average would be put up by the birds penned. My reasons for this were stated at the Conference in June last. Many good birds were penned that were a credit to their owners in every way, but it was the high percentage of poor class hens that was, in my opinion, bound to affect the general average, no matter what the weather conditions might prove.

As far as the industry is concerned, we could afford to look with equanimity on a year's retrogression in competition averages, if the outlook in poultry-keeping generally did not present a correspondingly sinister appearance. It is feared that these figures reflect to some extent a general decline in quality, and it will be well for the poultry farmer to ask himself the question, "Have I secured as good development in my young stock as in previous years, and if not, why?" A general analysis of the position will, I think, result in an almost general conclusion that there is a too great reliance on the factor of inheritance of egg-laying capacity and pelvic measurements, and too little on the class of development secured in rearing the young. The number of birds that have had to be rejected among those just received for the 1919–20 competition, I think, bears testimony in support of this view. It has been with great reluctance that I have had rejected a larger number of birds than usual; but in the interests of the industry generally this course had to be adopted, because, without unduly stressing the question of breed, type and character, most of the birds rejected were lacking in physique, and this in itself is an indication of poor development, as no matter what the inheritance factor may be, good development is essential to maintain laying ability.

Leading Groups.

The contest between the three leading groups in the light breed section (all Leghorns) was for months a close one, and the positions of Messrs. McInnes, Whitelaw and Newman excited keen speculation as to which would be the winner; it was only during the last two weeks that the position became defined in favour of Mr. McInnes. In the heavy breeds, Mr. Brown, runner-up in that section, at one time appeared likely to overtake Mr. Drayton's group.

Comparison of Weights.

A comparison of the weights of the winning pens of the 1917–18 with those of the 1918–19 competition, and their respective performances will be of interest.

Light Breeds.

	Average Weight.				No. of Eggs laid by group.	Average per hen.
	Commencement of Competition.		End of Competition.			
1917–18.	lb.	oz.	lb.	oz.		
Mrs. M. Chalmers, White Leghorn ...	4	0$\frac{5}{6}$	4	13	1,525	254
1918–19.						
Mr. McInnes, White Leghorn	3	10$\frac{2}{3}$	3	14	1,448	241

Heavy Breeds.

	Average Weight.				No. of Eggs laid by group.	Average per hen.
	Commencement of Competition.		End of Competition.			
1917–18.	lb.	oz.	lb.	oz.		
C. Judson, Black Orpington	5	10$\frac{1}{2}$	6	11$\frac{2}{3}$	1,613	268
1918–19.						
A. Drayton, Black Orpington	5	8	6	1	1,517	252

It might also be mentioned that the birds of Mr. P. Newman, runner-up in the light breeds this year, weighed an average of 3 lb. 8$\frac{5}{6}$ oz. on entry, and only 3 lb. 11$\frac{1}{6}$ oz. at the conclusion of the competition.

How the Competition Birds are Fed.

The birds are fed upon a simple ration which is, perhaps, with few exceptions, within the reach of every commercial poultry farmer.

Morning Feed.—The morning mash consists of pollard 60 per cent., bran 20 per cent., lucerne dust 12 per cent., meat or blood meal 8 per cent., when of low grado, say, 40 per cent. proteid content, or 6 per cent. when of a higher grade, say 60 per cent. proteid content, whichever is available; common salt is used in proportion of 22 oz. to each 100 lb. of mash. The salt is dissolved in the water with which the mash is mixed. The ratio aimed at is 1 to 4·5.

Midday Feed.—Chaffed green food, mostly lucerne.

Evening Feed.—Two-thirds wheat to one-third cracked maize.

The birds are fed all they will eat at each of two meals per day.

No condiments or stimulants of any kind whatever are used.

It might be stated that no bird, or group of birds, whatever their prospects of making high records, receives any extra attention or different treatment in any way from others less promising, nor is any bird kept beyond the expiration of the competition for the purpose of obtaining a 365-days' laying result, so that the tally obtained in these tests is put up absolutely between the date of commencement—1st April, and 31st March following.

Detailed Returns.

The following tables give full details of the number of eggs laid by the individuals in each group of six birds, together with the market value and weight of the eggs.

Second-year Hens. Section D—Light Breeds.

Owner and Breed.	First Year.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Second Year.		Total, 2 years.	Weight per doz.	Value, Second Year.	Total Value.
														Individual Totals.	Group Totals.		oz.	£ s. d.	£ s. d.
1. C. Leach, Revesby : White Leghorn	236	2	0	16	19	20	23	23	21	22	21	16	18	201					
	221	7	0	16	19	21	25	23	18	21	19	18	18	205					
	253	19	20	11	16	22	22	23	22	19	22	16	21	233					
	260	16	21	14	14	18	18	16	12	12	16	7	7	471					
	260	15	0	18	15	18	22	27	23	24	16	0	0	178*					
	233	13	0	15	10	17	16	6	7	9	12	9	2	116	1,104	2,567	25·0	6 2 8½	13 19 4
2. A. Duffield, Pennant Hills road, Carlingford : White Leghorn.	236	12	0	15	19	18	22	20	21	22	19	19	13	200					
	257	6	0	7	22	20	25	16	23	24	25	16	15	199					
	227	14	0	19	13	10	23	27	22	21	26	10	0	185†					
	197	8	8	21	20	20	22	23	15	0	8	21	25	191					
	243	1	0	15	10	23	23	25	21	22	24	16	14	194					
	218	0	0	15	15	22	26	26	22	12	25	18	16	197	1,166	2,544	25·7	6 4 1¼	13 3 11½
3. Mrs. M. Chalmers, Rocky Point road, Kogarah : White Leghorn.	266	0	0	9	7	20	23	21	21	19	11	1	0	132					
	254	10	0	4	6	17	22	23	22	20	21	16	12	173					
	240	13	9	12	16	15	14	16	11	18	7	12	16	159					
	252	13	0	0	7	19	21	24	20	19	21	17	1	162					
	259	14	0	2	18	19	23	23	21	19	21	18	18	196					
	254	12	0	13	12	18	20	13	13	18	21	16	20	176	998	2,523	26·4	5 4 9¼	13 10 11½
4. W. H. Cole, Glenrock, Heathcote : White Leghorn ..	240	7	0	5	16	20	24	20	16	16	11	20	10	165					
	249	4	0	14	11	21	22	21	18	21	19	16	19	186					
	240	2	0	9	16	9	15	23	18	21	20	16	0	149					
	253	11	0	2	19	7	22	12	18	24	24	19	0	158					
	258	18	1	4	17	19	23	24	21	10	11	0	7	155					
	251	9	0	13	21	20	22	17	19	20	19	16	16	192	1,005	2,496	25·0	5 4 3¾	13 4 0
5. Mr . G. Reed, Helen-street, Sefton Park : White Leghorn.	226	0	10	19	17	19	20	23	22	23	22	14	16	205					
	233	1	0	0	4	20	22	23	24	23	22	18	4	161					
	212	13	10	18	20	20	14	13	18	15	9	15	15	180					
	259	3	0	7	7	15	22	24	21	21	20	18	2	160†					
	246	4	1	20	19	17	21	17	16	20	21	16	15	187					
	220	1	0	12	10	8	20	23	22	22	20	15	18	171	1,064	2,460	24·0	5 12 1	12 19 5½
6. S. P. Simmons, Croydon-road, Hurstville : White Leghorn.	197	7	0	16	18	13	23	27	23	23	21	4	0	175					
	161	0	0	0	0	13	20	19	20	18	19	6	5	120					
	230	3	0	0	0	14	24	26	24	25	23	20	14	173					
	223	14	0	10	10	22	24	25	22	23	23	19	2	194					
	251	0	0	0	11	23	24	26	24	23	25	20	23	199					
	247	3	0	0	18	5	24	23	20	23	19	0	0	135	996	2,305	24·7	4 16 4¼	11 8 10½
7. W. Maskell, Farley : White Leghorn	221	0	0	10	7	22	24	25	20	0	13	19	13	153					
	264	16	0	4	21	22	22	14	4	16	4	0	10	133					
	243	12	15	1	21	19	17	20	11	13	12	9	11	161					
	278	18	1	8	21	20	25	21	25	25	23	16	1	204†					
	104	0	0	0	0	0	0	0	0	0	0	0	0	0*					
	263	6	0	4	24	22	26	24	27	22	27	20	22	224	875	2,248	24·4	4 12 1¾	11 19 7¾

* Bird died; not replaced. † Bird ineligible for individual prizes—eggs under weight.

SECTION D—Light Breeds—*continued.*

Owner and Breed.	First Year.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Second Year.		Total, 2 years.	Weight per doz.	Value Second Year.	Total Value.
														Individual Totals.	Group Totals.		oz.	£ s. d.	£ s. d.
8. Bella Vista Poultry Farm, Mount Druitt: White Leghorn.	232	10	0	0	8	22	18	21	21	21	21	18	24	184					
	257	16	0	17	21	22	22	19	5	9	20	0	0	151					
	265	19	18	14	17	17	22	19	17	21	23	14	3	204					
	205	1	2	0	0	0	0	0	0	0	0	0	0	3*					
	165	5	1	3	2	13	6	14	15	4	5	0	0	68					
	246	8	0	19	18	20	24	20	21	22	21	18	14	205	815	2,185	25·3	4 8 7	11 14 1¼
9. E. T. Rhodes, Quarry-road, Ryde: White Leghorn..	205	9	9	17	4	18	19	21	13	16	13	15	16	170					
	207	0	0	6	6	11	18	17	18	16	13	9	0	114					
	232	1	0	15	19	21	22	22	23	21	22	17	6	189					
	237	0	0	16	9	19	21	22	19	19	19	16	2	162					
	217	0	0	12	20	18	20	18	20	8	19	15	14	164					
	238	5	0	16	20	0	0	0	0	0	0	0	0	41*	840	2,176	25·0	4 8 0¾	11 11 6¾
10. L. Bulluss, Mt. View Villa, Glenfield: White Leghorn	190	10	0	4	10	19	23	25	24	12	20	4	0	151					
	246	0	0	16	21	23	25	24	23	22	21	17	0	192					
	217	16	11	5	8	4	22	17	12	7	18	0	7	127†					
	229	9	0	16	12	20	23	23	19	21	20	4	0	167					
	200	0	2	17	6	10	14	22	20	8	0	0	0	99*					
	182	0	0	13	22	21	25	23	21	24	0	0	0	149	885	2,149	24·2	4 7 7	10 17 11¾

* Bird died: not replaced. † Bird ineligible for individual prizes—eggs under weight.

SECTION E—Heavy Breeds.

1. C. Judson, Dartford, Thornleigh: Black Orpington	266	16	11	0	8	22	20	24	10	25	14	20	20	190					
	228	26	23	18	20	23	26	24	18	18	19	11	18	244					
	211	9	0	11	22	22	17	18	16	18	12	10	9	164					
	312	23	25	22	19	25	24	26	21	9	9	14	4	221					
	305	21	21	19	20	21	13	11	11	8	9	2	0	156					
	291	23	12	0	12	25	27	26	25	20	20	8	3	201	1,176	2,789	26·1	6 15 10¾	15 8 2
2. E. F. Silcock, Margaret-street, Tenterfield: Silver Wyandotte.	214	23	23	19	20	21	19	19	17	23	18	3	9	214					
	251	20	21	18	20	19	20	23	20	23	19	13	20	236					
	231	21	16	1	20	20	21	20	21	8	16	2	15	181					
	188	17	3	9	16	14	13	17	20	24	16	17	11	177					
	242	21	19	16	16	21	12	13	4	0	2	11	0	135					
	244	20	2	15	19	19	20	23	19	22	20	16	5	200	1,143	2,513	24·9	6 14 8¼	13 15 4
3. P. C. McDonnell, "Allerton," Beecroft: Black Orpington.	253	7	0	1	19	6	12	12	19	20	8	15	6	125					
	202	7	0	0	9	11	24	20	15	23	13	19	16	157					
	216	0	0	0	0	2	21	21	17	15	19	13	21	129					
	243	19	2	9	11	23	19	12	9	9	20	8	0	141					
	249	21	13	13	18	8	18	22	8	14	12	11	11	169					
	212	18	11	3	0	11	20	22	16	6	14	6	2	129	850	2,225	25·0	4 12 6	11 17 3¼

SECTION E—Heavy Breeds—*continued.*

Owner and Breed.	First Year.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Second Year.		Total, 2 years.	Weight per doz.	Value, Second Year.	Total Value
														Individual Totals.	Group Totals.				
																	oz.	£ s d.	£ s. d.
4. G. Hopping, Wattle Dell, Ingleburn: Black Orpington.	213	5	0	10	20	20	21	22	21	18	18	14	7	176					
	236	11	14	10	4	19	10	15	11	17	16	6	16	149					
	215	10	0	13	15	16	11	6	0	0	13	10	0	94					
	270	23	23	21	20	19	26	26	15	16	17	11	13	230					
	243	3	0	12	10	9	22	21	8	19	16	15	7	142					
	245	0	0	0	0	0	0	0	0	0	0	0	0	0*	791	2,213	27·0	4 9 2¾	11 19 8½
5. J. T. Brett, "Kalora," Woodville-road, Guildford: Black Orpington.	218	0	0	0	16	23	21	14	22	6	18	9	12	141					
	184	0	2	25	26	26	26	20	17	8	12	17	4	183					
	197	0	0	10	3	1	20	13	9	16	17	5	18	112					
	233	1	0	0	7	25	14	22	17	16	8	12	15	137†					
	259	18	1	0	13	24	25	24	15	21	16	8	23	188					
	191	0	21	22	20	21	10	23	7	14	13	14	16	181†	942	2,224	24·5	4 19 10	12 1 10
6. J. Roberts, Prospect-road, Wentworthville: Black Orpington.	162	3	21	11	7	17	11	15	16	16	11	7	21	156					
	250	20	20	0	8	17	19	18	14	17	18	14	12	177					
	254	3	0	7	19	10	24	8	9	17	17	0	19	133					
	192	3	0	0	1	18	24	11	22	11	7	15	4	116					
	217	20	16	7	8	15	13	16	12	17	10	17	6	157					
	227	17	18	17	6	0	15	20	16	19	16	7	21	172	911	2,213	26·9	5 5 1¼	12 4 5¾
7. J. Turner, Mynora, Moruya: Silver Wyandotte ..	167	17	12	14	23	10	18	18	14	13	14	13	12	178					
	158	0	0	0	0	0	1	0	0	0	0	0	0	1					
	185	6	18	13	9	13	23	24	21	9	14	11	19	180					
	216	15	18	17	22	23	25	25	13	15	10	5	19	207					
	292	24	22	23	17	19	22	2	7	5	22	4	0	167					
	211	17	22	14	8	18	23	19	15	15	13	9	5	178	911	2,140	24·9	5 9 3	12 4 6½
8. H. Bastin, Priam-street, Sefton Park: Langshan ..	240	21	14	0	6	21	23	27	25	7	22	0	22	188					
	246	17	7	1	20	22	24	25	21	20	0	0	0	157*					
	217	0	3	17	6	7	13	22	18	11	10	9	5	121					
	225	0	0	0	6	13	14	14	15	14	14	11	9	110†					
	160	17	4	6	11	13	17	11	9	13	7	9	12	129					
	193	12	0	0	0	9	22	26	11	4	22	4	21	131	836	2,117	25·6	4 8 10½	11 5 11¾
9. A. R. Miles, Rosebank, Sefton Park: Black Orpington.	172	7	11	12	18	12	13	23	13	11	13	9	13	155					
	226	16	2	0	17	18	20	16	17	19	14	10	18	167					
	217	19	1	0	0	19	15	22	18	15	13	18	4	144					
	273	0	0	0	0	0	0	0	0	0	0	0	0	0					
	251	21	20	18	15	17	11	0	0	0	0	0	0	102					
	192	23	2	7	17	1	19	15	6	16	11	6	18	141	709	2,040	26·3	4 2 10¾	11 8 0
10. A. Chick, Murray-road, Beecroft: Black Orpington	143	0	0	10	23	26	5	6	0	5	0	3	0	78					
	190	16	18	7	8	17	21	22	12	9	18	10	18	176					
	153	0	0	0	0	0	0	0	0	0	0	0	0	0*					
	202	0	0	18	18	19	15	16	10	11	9	11	0	127					
	252	15	0	0	12	24	17	18	13	23	21	19	20	182					
	202	20	2	17	22	21	19	14	14	20	10	18	19	196	759	1,901	24·7	4 4 11	10 5 11

Bird died ; not replaced. † Bird ineligible for individual prizes—eggs under weight.

SEVENTEENTH ANNUAL COMPETITION.

Section A (Light Breeds).

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Individual Totals.	Group Totals.	Weight per dozen. oz.
1. M. McInnes, Ingleburn: White Leghorn. Market Value, £8 8s. 3d.	5	21	15	21	22	25	21	23	23	24	19	21	240		
	19	22	20	20	23	25	25	24	24	21	18	21	262		
	18	18	17	21	21	23	22	16	19	20	17	22	234		
	15	22	20	11	23	23	23	22	22	22	14	21	238		
	16	19	22	20	22	24	22	20	23	24	20	8	240		
	3	15	19	21	24	25	28	21	22	24	12	20	234	1,448	24·7
2. R. Whitelaw, Bungarrabee-road, Blacktown: White Leghorn. Market Value, £8 2s.	13	16	14	18	18	22	22	21	18	18	14	12	206		
	3	25	23	24	23	28	27	26	28	23	20	17	267		
	8	12	19	21	24	25	24	23	20	12	9	4	201		
	22	26	24	27	25	27	26	24	22	23	19	17	282‡		
	19	22	23	22	21	23	24	20	25	0	16	19	234		
	14	19	14	9	20	24	22	22	23	21	18	10	216	1,406	25·0
3. P. Newman, Blacktown: White Leghorn. Market Value, £8 3s. 8½d.	10	21	19	16	18	22	22	23	22	19	15	11	218		
	11	21	18	21	20	23	27	25	25	23	18	19	251		
	9	23	23	22	26	25	24	24	23	18	7	12	236		
	3	19	22	22	25	23	22	21	24	18	16	19	234		
	12	20	22	24	24	25	17	22	23	18	17	18	242		
	8	20	24	22	25	25	26	23	23	16	12	18	242	1,423	25·5
4. L. K. Pettit, Balaclava-road, Eastwood: White Leghorn. Market Value, £7 17s. 9½d.	22	24	20	21	23	25	23	23	22	24	19	17	263		
	5	15	8	17	11	21	22	20	18	14	9	3	163		
	12	16	21	20	21	22	24	26	25	24	21	20	252		
	12	21	21	19	22	24	25	22	23	22	20	6	237		
	8	21	21	23	23	25	26	25	24	24	18	21	259		
	15	8	19	19	20	20	25	23	22	21	13	4	209	1,383	24·7
5. A. J. Heaver, Western road, Parramatta: White Leghorn. Market Value, £7 13s. 9d.	19	10	8	20	22	24	23	23	25	22	15	19	230		
	6	18	18	20	22	25	24	23	24	21	16	22	239		
	23	8	15	14	24	16	15	21	16	19	10	12	193		
	1	23	20	21	23	25	27	25	26	24	19	0	234		
	3	11	14	17	24	25	19	18	23	22	19	15	210		
	19	22	21	19	24	22	24	16	18	25	19	20	249	1,355	26·0
6. J. J. Vaughan, Griffith: White Leghorn. Market Value, £7 7s. 3¼d.	3	0	0	21	20	22	24	22	22	23	19	22	198		
	9	9	16	19	23	24	26	23	25	22	11	0	207		
	3	0	9	23	21	24	27	25	25	21	20	20	218		
	13	4	23	24	24	26	26	25	26	24	22	21	258		
	8	0	17	26	27	25	25	21	25	24	21	24	243		
	11	22	19	21	22	23	25	23	23	22	19	14	244	1,368	26·0
7. C. C. Kennett, Hazelwood Farm, Glenfield: White Leghorn. Market Value, £7 18s. 1d.	13	22	19	21	21	23	24	18	22	22	17	19	241		
	0	13	20	18	20	23	20	20	20	16	8	11	189		
	5	24	21	23	23	25	25	24	24	24	20	19	257		
	17	21	21	13	24	24	23	25	24	23	19	21	255		
	18	20	19	20	19	12	8	16	9	9	5	9	164		
	21	17	21	23	21	25	20	22	22	23	16	12	243	1,349	25·2
8. W. R. Hulks, Tower-street, East Hills: White Leghorn. Market Value, £7 13s. 10¾d.	11	21	18	22	22	24	24	23	23	22	15	0	225		
	1	18	17	17	24	25	25	23	24	22	17	12	225		
	11	15	12	23	24	26	27	26	27	26	19	21	257		
	13	25	22	20	21	4	0	0	0	0	0	0	105†		
	14	21	18	19	22	25	21	20	23	21	18	18	240		
	19	21	22	22	24	28	23	23	26	26	19	20	273	1,325	25·0
9. F. L. Parker, Walters-road, Blacktown: White Leghorn. Market Value, £7 11s. 8¼d.	5	19	21	18	23	25	19	24	25	22	20	19	240		
	20	22	22	21	22	24	26	25	25	15	0	0	222†		
	18	24	21	22	25	24	25	18	2	14	10	13	216		
	6	19	20	10	22	23	25	20	22	22	17	19	225		
	10	6	6	11	21	25	25	24	24	22	15	7	196		
	17	22	22	21	18	22	20	14	19	19	15	13	222	1,321	25·2
10. W. E. Webster, "Bolwarra," Murray-road, Beecroft: White Leghorn. Market Value, £7 3s. 0¼d.	4	0	17	24	25	25	25	25	24	23	19	19	230		
	4	0	3	22	22	23	24	19	18	19	15	17	186		
	4	0	11	22	22	24	26	25	23	26	22	20	225		
	12	0	15	26	24	28	28	28	26	23	20	23	253		
	1	4	21	21	20	23	24	24	23	21	16	7	205		
	4	22	18	22	23	25	26	23	23	23	18	21	248	1,347	24·2
11. J. S. Crittle, Eastwood: White Leghorn. Market Value, £7 6s. 2½d.	1	14	11	16	20	22	25	26	25	23	17	9	209		
	4	21	14	14	18	16	15	16	16	17	11	11	173		
	12	16	18	18	22	23	25	22	26	22	19	20	243		
	16	16	15	16	20	23	24	23	22	22	18	20	235		
	7	22	18	21	22	23	24	23	23	19	13	0	215		
	14	23	19	19	20	21	24	24	23	23	10	0	220	1,295	25·2
12. T. E. Jarman, Wycombe street, Epping: White Leghorn. Market Value, £7 0s. 3½d.	0	0	4	21	23	25	21	15	14	21	14	7	165		
	13	20	23	23	23	26	27	21	24	25	19	19	263		
	0	11	22	22	26	26	25	23	22	23	19	20	239		
	8	10	20	16	21	23	22	22	21	21	9	8	201		
	7	2	22	22	24	21	21	20	23	21	10	0	193		
	3	16	22	20	21	23	24	23	22	19	15	19	227	1,288	26·0

† Bird died; not replaced. ‡ Bird ineligble for individual prizes; eggs under weight.

SEVENTEENTH ANNUAL COMPETITION—*continued.*

Section A (Light Breeds)—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March	Individual Totals.	Group Totals.	Weight per dozen.
															oz.
13. T. Partridge, "Glengarry," Bridge-road, Westmead: White Leghorn. Market Value, £7 0s. 1½d.	17	20	19	19	21	22	25	21	21	21	16	19	241		
	0	17	18	21	23	23	25	22	21	25	13	15	223		
	13	19	16	20	21	21	22	18	15	6	1	0	172		
	0	12	19	21	21	20	19	19	22	20	15	17	205‡		
	5	22	20	22	24	25	28	23	26	24	15	7	241		
	10	19	4	0	20	24	24	24	23	22	5	0	175	1,257	24·7
14. "Burley Pens," Church-street, Carlingford: White Leghorn. Market Value, £7 2s. 1d.	4	17	19	21	23	23	23	19	21	22	10	16	218*		
	0	12	24	24	24	26	25	22	24	23	19	18	241*		
	9	21	19	17	18	20	23	19	20	7	0	0	173		
	13	12	0	7	21	25	24	20	22	21	18	18	201		
	14	21	20	23	25	26	27	24	21	24	13	20	258		
	6	14	20	22	21	22	23	14	11	14	8	4	179	1,270	26·2
15. Willow Grange Poultry Farm, Boolaroo: White Leghorn. Market Value, £6 14s. 2½d.	0	8	19	10	22	24	26	24	25	20	17	20	215		
	0	0	0	15	22	24	22	18	20	20	5	8	154‡		
	17	18	20	21	21	24	26	23	20	21	10	16	237*		
	18	6	20	20	20	24	24	23	24	23	16	17	235		
	17	20	20	22	24	25	24	24	24	24	10	0	234		
	7	0	7	21	21	24	24	20	19	22	7	0	172	1,247	24·5
16. G. White, Clanwilliam-st., Willoughby: White Leghorn. Market Value, £6 18s. 3¼d.	0	2	20	21	23	25	24	25	25	25	18	23	231		
	0	0	14	24	24	22	24	22	21	24	18	21	214		
	0	0	9	21	21	24	23	25	25	23	11	0	182		
	5	21	19	5	23	23	22	24	21	24	18	20	225		
	0	14	14	12	7	21	23	22	22	21	15	16	187		
	0	22	15	15	24	26	24	27	26	26	21	23	249	1,288	25·0
17. G. N. Nolland, Kenthurst: White Leghorn. Market Value, £7 0s. 5d.	3	9	15	22	22	23	25	23	24	23	13	18	220		
	12	17	4	19	21	21	22	21	19	20	12	20	208		
	3	18	9	10	20	22	22	16	17	22	15	15	189		
	7	5	16	8	18	23	23	24	23	22	17	10	196		
	2	21	20	21	22	25	25	24	23	22	17	16	238		
	20	22	21	10	23	22	24	19	21	21	9	0	212	1,263	25·2
18. J. F. Zammit, Hoxton Park *via* Liverpool: White Leghorn. Market Value, £6 14s. 6½d.	19	15	0	10	18	24	25	20	23	6	9	0	169		
	13	17	17	20	21	22	23	20	21	10	14	20	218		
	4	18	17	21	19	23	23	22	23	23	18	21	232		
	3	13	4	11	21	21	23	24	24	22	18	2	186		
	8	21	22	19	21	24	22	23	23	22	6	14	225		
	18	0	15	10	20	22	24	22	22	22	15	0	190	1,220	25·0
19. B. Clarke, Barber's Estate, Old Guildford: White Leghorn. Market Value, £6 15s. 8d.	18	21	18	20	21	24	23	24	21	19	14	19	242		
	2	15	5	11	14	21	19	20	19	20	14	0	160		
	13	21	20	20	22	23	25	15	17	15	6	15	212		
	17	20	21	22	23	26	25	26	26	23	19	21	269		
	15	14	14	18	14	19	19	21	19	2	0	0	155		
	0	0	1	16	13	22	23	21	15	19	17	20	167*	1,205	25·0
20. H. G. Burriss, Orara-street, Waitara: White Leghorn. Market Value, £5 17s. 0¾d.	0	17	2	24	22	27	26	25	22	23	16	2	206*†		
	16	21	21	21	21	23	23	23	22	23	19	0	233		
	14	20	16	21	20	18	20	16	7	0	0	0	152		
	0	0	3	15	19	23	24	24	22	20	4	0	154		
	6	0	4	24	25	25	26	24	22	21	14	0	191		
	5	2	8	21	21	25	20	27	25	22	19	2	197	1,133	25·7
21. Hillcrest Poultry Farm, Berowra: White Leghorn. Market Value, £6 6s. 4d.	0	16	21	22	25	24	23	21	23	23	15	20	233		
	0	0	13	19	20	22	20	21	23	19	10	4	171		
	20	24	20	23	23	25	15	21	21	17	9	0	218		
	0	1	22	21	19	21	20	18	18	19	9	0	168		
	0	5	18	18	21	23	23	20	21	22	13	18	202		
	0	0	6	21	20	22	22	21	20	22	18	18	190	1,182	25·5
22. L. Graham, Eastern Creek, Rooty Hill: White Leghorn. Market Value, £6 15s. 10¾d.	0	6	14	9	20	21	22	18	16	10	0	0	136		
	6	20	19	21	20	21	20	19	20	22	18	17	223		
	12	21	20	19	21	20	21	20	19	20	14	18	225		
	4	18	22	25	23	23	23	22	23	22	18	20	243		
	11	15	11	19	21	23	23	19	15	21	13	17	208		
	5	16	19	11	19	21	21	9	9	21	7	6	164	1,199	25·2
23. Wharepaka Poultry Yards, Berowra: White Leghorn. Market Value, £6 15s. 0½d.	15	23	21	21	21	23	25	25	22	22	17	3	238		
	10	20	21	19	21	21	20	1	5	0	0	0	138†		
	6	19	8	13	14	15	15	13	12	14	7	4	140		
	7	15	19	18	16	13	21	21	21	23	10	0	184		
	15	21	16	10	22	23	22	23	23	22	15	19	231		
	11	21	14	21	23	23	22	20	23	20	18	19	235	1,166	26·0
24. Mrs. W. D. Bradburne, Paris-street, Kogarah: White Leghorn. Market Value, £6 10s. 11¾d.	7	19	15	19	21	23	23	11	14	24	11	20	207		
	12	20	7	21	22	23	24	14	18	11	12	8	192		
	16	0	10	20	23	25	22	25	17	23	19	0	200		
	0	4	7	21	19	21	21	19	20	20	4	0	156		
	16	19	10	18	21	20	22	22	21	20	17	19	225		
	7	18	17	20	18	21	18	18	17	17	13	16	200	1,180	26·5

* Bird replaced; score struck out. † Bird died; not replaced.
‡ Bir ineligible for individual prizes; eggs under weight.

SEVENTEENTH ANNUAL COMPETITION—*continued.*

Section A (Light Breeds)—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Individual Totals.	Group Totals.	Weight per dozen.
25. W. I. Baker, Cranston's-road, Dural: White Leghorn. Market Value, £6 8s. 4½d.	1	10	22	24	24	22	25	22	16	0	0	0	†166		oz.
	14	23	21	24	21	0	0	0	0	0	0	0	†103		
	1	0	0	6	19	23	24	22	22	22	11	0	150		
	14	23	20	16	13	20	24	18	22	23	19	17	229		
	15	21	21	24	26	28	29	25	26	23	19	20	277		
	2	15	7	20	21	22	23	23	22	21	18	20	214	1,139	24·5
26. W. H. Appleyard, Old Guildford: White Leghorn. Market Value, £5 15s. 3d.	17	6	13	4	22	20	23	22	24	22	16	0	189		
	0	19	19	10	20	19	24	21	22	22	16	16	208		
	0	16	21	21	21	24	25	24	24	22	17	3	218		
	0	2	20	22	22	24	26	17	19	18	13	19	202		
	0	0	0	10	18	25	24	23	23	23	16	2	164		
	0	0	0	9	22	23	24	22	19	21	0	0	140	1,121	24·7
27. B. Carnell, Old Kent road, Punchbowl: White Leghorn. Market Value, £5 18s. 2¾d.	0	0	9	8	12	24	24	23	19	19	0	0	138		
	13	18	14	20	19	23	19	19	17	19	16	8	205		
	1	9	10	12	22	24	25	25	18	17	8	0	171		
	0	11	19	22	21	23	20	17	14	13	1	17	178		
	12	22	22	22	22	25	23	22	23	16	8	22	239		
	14	14	0	8	21	26	25	24	14	19	9	0	174	1,105	25·0
28. M. C. Byrne, Revesby: White Leghorn. Market Value, £6 4s. 4d.	18	19	15	16	20	21	19	19	17	21	16	18	219		
	2	16	14	19	20	23	20	8	9	4	0	0	135		
	18	0	19	23	22	21	22	20	20	20	14	18	217		
	0	21	19	21	20	24	23	21	27	23	14	15	228		
	11	20	20	20	17	20	13	15	17	16	3	7	179		
	0	0	13	18	22	21	22	15	4	10	5	0	130	1,108	24·5
29. Elliott Bros., Blacktown: White Leghorn. Market Value, £5 19s. 11d.	7	10	8	11	15	23	25	24	23	22	14	0	182		
	0	11	17	16	18	20	20	17	17	19	10	18	183		
	3	0	6	18	20	24	21	20	22	21	17	17	189		
	5	0	7	23	20	22	23	22	19	18	18	16	193		
	6	20	9	14	20	23	18	15	14	14	0	0	153		
	14	20	19	19	21	24	23	21	16	10	5	21	213	1,113	26·2
30. J. L. Hunt, "Barton," Cowell's-lane, Ermington: White Leghorn. Market Value, £6 3s. 0½d.	11	21	20	24	24	26	27	28	26	22	12	23	264		
	1	13	13	18	17	20	12	15	8	11	0	0	128†		
	1	22	14	25	26	27	25	19	20	23	16	15	233		
	1	13	8	10	18	15	19	19	19	19	10	16	167		
	0	0	14	22	24	24	5	0	1	0	12	18	120		
	0	0	9	24	24	22	27	30	29	21	8	22	216	1,128	26·2
31. D. Kennedy, River-road, East Hills: White Leghorn. Market Value, £5 19s. 7½d.	0	0	11	21	23	25	27	24	23	24	19	17	214		
	0	0	12	21	21	24	25	24	22	20	15	10	194*		
	2	7	11	20	19	21	21	17	10	19	8	8	163		
	2	15	21	23	24	26	26	27	24	24	13	7	232		
	8	17	23	21	19	16	19	15	18	22	19	20	217		
	4	19	18	17	15	1	0	0	0	0	0	0	74†	1,094	24·7
32. W. H. Hampton, Gibson-avenue, Bankstown: White Leghorn. Market Value, £6 6s. 11¼d.	14	20	6	7	20	23	23	20	21	17	15	20	206		
	0	0	11	21	20	23	25	21	25	24	20	20	210		
	9	21	19	20	22	24	24	24	24	23	17	20	247		
	12	23	20	22	24	24	25	24	22	23	18	18	255		
	13	17	13	4	16	20	21	23	23	22	18	14	204		
	0	0	0	0	0	0	0	0	0	0	0	0	0‡	1,122	24·9
33. A. Greentree, Wilberforce: White Leghorn. Market Vaiue, £6 2s. 6¼d.	6	17	20	21	23	24	24	15	0	0	0	0	150†		
	12	19	18	20	23	23	25	22	20	14	18	19	233		
	14	20	19	21	23	22	22	15	17	22	0	0	195		
	5	7	14	20	19	23	16	6	13	20	7	0	150		
	2	20	18	22	24	28	29	19	24	25	17	18	246‡		
	13	14	22	23	13	2	0	0	2	2	0	0	‡91	1,065	24·0
34. Mrs. E. J. Hunt, Careenya, Berowra: White Leghorn. Market Value, £6 2s. 3¼d.	15	17	16	18	19	19	19	17	18	18	9	11	196		
	10	17	8	17	19	20	22	18	17	17	5	7	177		
	7	12	13	9	17	22	21	17	19	1	6	9	153		
	19	22	22	22	22	24	22	23	17	5	9	14	221		
	12	11	14	8	16	23	23	15	15	17	8	12	174		
	4	7	7	17	16	21	19	13	17	15	7	16	159	1,080	26·0
35. Gilliver Bros., "Fairview," Swete-street, Lidcombe: Minorca. Market Value, £5 17s. 10d.	13	21	19	19	20	0	0	0	0	0	0	0	92†		
	3	21	17	5	20	22	22	13	15	15	0	0	153		
	0	10	22	24	25	11	23	21	22	20	17	1	196		
	16	20	6	13	19	19	18	20	20	21	21	13	206		
	0	13	15	19	17	21	20	18	20	21	12	0	176		
	15	8	16	14	19	21	24	21	20	21	17	14	210	1,033	25·7
36. J. R. Stewart, Tahmoor *via* Picton: White Leghorn. Market Value, £5 3s. 7d.	2	0	11	21	21	20	22	17	0	0	0	0	114†		
	0	9	5	3	16	23	27	24	25	22	18	11	183		
	2	0	5	19	25	25	25	19	22	17	0	0	159		
	7	21	21	23	21	22	22	20	21	21	13	3	215		
	7	15	16	5	21	24	28	26	24	22	18	18	224		
	0	0	7	2	18	19	20	19	23	18	0	0	126	1,021	24·7

* Bird replaced: score struck out. † Bird died; not replaced.

‡ Bird ineligible for individual prizes; eggs under weight.

SEVENTEENTH ANNUAL COMPETITION—*continued.*

Section A (Light Breeds)—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Individual Totals.	Group Totals.	Weight per dozen.
															oz.
37. D. Chrystal, Old Kent road. Punchbowl: White Leghorn. Market Value, £5 16s. 1¾d.	0	11	15	20	20	21	10	1	0	2	0	0	100‡		
	0	12	22	23	24	22	22	19	22	0	0	21	187		
	1	0	2	9	15	18	20	19	21	22	17	21	165		
	10	14	19	22	21	21	11	12	20	17	10	13	190		
	2	21	17	18	20	22	20	21	22	21	17	19	220		
	6	4	21	19	23	22	20	19	19	19	16	1	189	1,051	24·2
38. Ellis and Arnold, Schofields *via* Bankstown: White Leghorn. Market Value, £5 2s. 9¼d.	0	9	16	18	19	20	22	21	21	19	7	19	191		
	2	9	16	15	15	19	21	17	15	0	0	0	129†		
	0	0	16	15	17	20	21	22	20	19	15	9	174		
	4	0	11	13	18	20	23	21	17	17	11	0	155		
	0	0	18	22	22	27	24	27	25	21	18	18	222		
	0	0	0	12	20	23	24	23	21	14	13	0	150	1,021	27.2
39. Miss N. E. Cupitt, Fitzgerald-street, Windsor: White Leghorn. Market Value, £4 8s. 3¼d.	5	19	18	17	19	23	20	17	13	13	8	12	184		
	0	5	16	5	14	19	23	23	19	18	0	0	142		
	0	0	0	14	22	25	25	20	23	18	15	20	182		
	0	0	0	15	23	21	24	20	22	18	16	13	172		
	0	0	4	19	18	25	24	21	15	18	8	13	165		
	3	0	0	0	3	10	7	5	1	5	2	0	36	881	25·2
40. Brundah Poultry Farm. Harrow-road, Glenfield: White Leghorn. Market Value, £4 7s. 5¾d.	4	0	0	0	18	24	23	21	25	19	10	0	142		
	0	0	0	1	12	22	23	23	19	6	0	2	108		
	9	0	0	0	0	5	0	0	0	0	0	0	14†‡		
	0	2	4	18	24	19	19	24	22	22	13	2	169*		
	0	16	21	21	13	25	19	19	19	22	9	5	189		
	4	17	19	22	23	23	25	22	18	23	19	23	238	860	24·0

Section B (Heavy Breeds).

															oz.
1. A. Drayton, King's-road. Brighton-le-Sands, Rockdale: Black Orpington. Market Value, £9 3s. 6¾d.	25	24	21	22	21	18	21	17	16	18	9	19	231		
	17	24	24	24	25	27	21	19	17	16	16	21	251		
	18	22	22	24	22	20	22	17	16	15	11	19	228		
	22	21	21	19	19	24	26	23	24	24	18	20	261		
	28	25	27	30	29	29	31	23	28	25	21	28	324		
	14	22	22	21	24	21	22	18	17	21	6	14	222	1,517	24·7
2. A. E. Brown, Murray-road, Beecroft: Langshan. Market Value, £8 12s. 0½d.	10	26	22	25	24	27	22	19	18	14	14	16	237		
	0	7	23	25	27	29	26	25	27	22	17	16	244*		
	21	23	24	15	13	10	12	9	16	18	18	11	190		
	14	24	23	27	26	16	20	15	20	12	16	9	222		
	21	25	24	25	24	25	25	15	24	15	16	22	261		
	19	27	26	28	30	29	26	26	11	24	15	26	287	1,441	25·2
3. Mrs. W. V. Hopkins, Bridge-road, Westmead: Black Orpington. Market Value, £7 19s. 8¼d.	15	8	19	11	25	21	25	21	13	13	12	14	197		
	4	22	21	16	19	17	15	23	21	24	20	18	220		
	24	12	12	28	26	26	30	17	28	28	23	24	278‡		
	9	2	23	26	26	25	26	19	27	21	15	18	237		
	10	23	22	20	21	27	26	13	14	22	4	0	202		
	21	23	19	22	23	26	27	24	24	23	10	19	261	1,395	24·7
4. W. H. Forsyth, Forsyth-st. Willoughby: Silver Wyandotte. Market Value, £8 0s. 7½d.	15	23	22	25	26	15	25	14	14	11	13	16	217		
	17	23	20	23	23	25	23	18	21	6	18	19	236		
	17	23	21	20	20	25	23	21	21	16	12	19	238		
	0	23	7	12	9	19	22	21	12	19	7	9	160		
	22	19	22	23	20	21	18	17	12	0	7	19	200		
	19	23	24	27	27	29	28	26	25	21	22	24	295	1,346	25·5
5. Pert and Dunn, "Booyong," West Botany street, Arncliffe: Langshan. Market Value, £7 10s. 2¼d.	1	25	11	22	19	11	12	18	14	12	11	9	165‡		
	19	26	23	25	26	25	17	19	16	11	12	10	229		
	0	16	23	26	29	28	29	23	19	22	20	22	257		
	13	19	18	23	23	27	13	18	8	15	5	11	193		
	0	3	26	29	28	22	27	15	15	18	15	16	214*		
	22	22	24	25	26	27	25	19	18	6	13	15	242	1,298	24·0
6. D. A. Mobbs, Murray-road Carlingford: Silver Wyandotte. Market Value, £7 14s. 5¼d.	21	22	22	22	23	15	26	25	24	21	18	19	258		
	5	21	18	18	20	22	21	15	17	17	14	16	204		
	14	21	15	20	20	9	19	14	15	9	10	19	185		
	24	25	25	26	24	25	23	20	15	13	13	23	256‡		
	1	17	24	27	24	26	11	14	14	13	12	16	199		
	16	22	21	23	21	15	20	9	11	17	4	0	179	1,281	24·5

* Bird replaced; score struck out. † Bird died; not replaced.
‡ Bird ineligible for individual prizes; eggs under weight.

SEVENTEENTH ANNUAL COMPETITION—*continued.*

Section B (Heavy Breeds)—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Individual Totals.	Group Totals.	Weight per dozen.
7. G. E. Holmes, Burns Bay road, Longueville: Black Orpington. Market Value, £7 0s. 7½d.	0	0	5	28	12	19	20	17	13	15	12	10	151		oz.
	20	21	15	18	20	24	25	22	24	21	16	19	245		
	21	25	23	24	21	25	21	10	16	5	11	0	202		
	17	2	11	23	23	23	17	17	16	14	13	15	191		
	0	0	3	20	28	27	28	16	17	12	20	9	180		
	23	24	23	25	25	25	29	18	27	20	16	24	279	1,248	25·0
8. E. J. Kinney, Copeland-road. Beecroft: Silver Wyandotte. Market Value, £7 11s. 7¼d.	19	20	21	22	25	23	23	24	24	24	20	22	265		
	23	28	24	23	24	24	27	12	21	18	12	18	254		
	0	23	24	24	26	18	22	12	14	17	17	21	218		
	9	15	5	6	2	0	0	0	0	0	0	0	37†		
	11	24	24	22	23	24	21	11	20	21	11	20	232		
	10	25	22	23	25	24	24	21	12	16	15	23	240	1,246	24·3
9. C. E. Warren, Hillcrest-street, Punchbowl: Black Orpington. Market Value. £6 19s. 4½d.	20	25	22	21	22	21	20	11	22	10	10	15	219		
	16	24	1	20	27	16	18	21	22	16	20	18	219		
	1	2	26	21	24	26	24	13	0	0	0	0	137*†		
	6	15	22	22	22	25	26	20	19	20	11	0	208		
	10	22	23	23	24	25	22	10	21	17	6	20	223		
	0	3	21	24	22	23	22	23	25	21	17	20	221	1,227	25·5
10. S. W. Rutherford, The Esplanade, Guildford: Langshan. Market Value, £7 2s. 6½d.	20	22	21	23	23	25	28	14	20	21	9	15	241		
	14	1	22	28	27	30	25	15	19	8	12	12	213		
	24	15	22	24	14	25	12	19	16	10	9	17	207		
	5	25	26	26	25	23	22	9	20	10	17	18	226		
	15	23	21	22	22	16	21	9	12	9	9	7	186		
	0	0	16	14	24	17	14	15	12	13	10	11	146	1,219	26·0
11. V. H. Dariel. "Allawah." Toongabbie: Black Orpington. Market Value. £6 13s. 7½d.	20	22	22	21	11	26	16	2	0	0	0	2	142		
	11	0	0	15	24	20	22	14	14	20	14	19	173		
	0	0	9	21	25	27	24	24	22	21	19	20	212		
	6	8	21	23	24	25	26	22	14	14	15	18	216		
	20	23	21	20	24	24	24	20	20	22	14	15	247		
	10	0	1	26	25	27	23	27	23	21	17	18	218	1,208	25·7
12. R. P. Manton. "Glenview." Berowra: Black Orpington. Market Value. £6 14s. 1½d.	8	22	20	22	20	25	25	23	13	22	18	7	225		
	6	0	0	11	9	14	14	14	8	10	9	9	104		
	3	23	20	20	23	25	26	24	26	25	21	20	256		
	1	12	23	23	26	26	25	22	21	19	5	11	214		
	0	0	4	19	22	23	24	20	24	14	15	21	186		
	19	22	21	23	23	22	22	7	20	8	18	16	221	1,206	24·0
13. J. H. Madrers. Rocky Point road. Kogarah: Black Orpington. Market Value, £6 16s. 10½d.	19	22	20	21	20	18	19	12	21	16	8	19	215		
	20	12	19	19	9	25	14	17	13	13	15	18	194		
	20	25	25	25	22	23	21	12	10	13	11	6	213		
	4	24	13	20	25	23	16	17	12	13	14	11	192		
	10	2	1	12	23	22	26	18	16	18	18	15	181		
	0	21	20	22	23	19	18	14	14	9	11	1	172	1,167	24·7
14. G. Gurney, Murray-road, Beecroft: Silver Wyandotte. Market Value, £6 18s. 1½d.	22	23	23	23	25	26	29	18	14	23	20	22	268		
	10	9	23	12	8	15	18	17	11	4	0	0	127		
	1	7	13	10	4	0	0	2	3	3	9	5	57		
	24	15	20	19	21	20	22	18	18	17	16	10	220		
	2	9	26	27	29	28	19	17	19	27	12	25	240		
	21	22	22	21	22	25	19	20	20	23	13	20	248	1,160	24·2
15. Cimbria Poultry Farm Sefton Park: Plymouth Rock. Market Value, £6 14s. 7d.	15	21	24	24	23	15	21	10	7	14	14	19	207		
	17	19	14	13	23	16	9	8	5	10	13	5	152		
	18	16	17	19	20	26	20	13	13	19	13	3	197		
	0	0	15	26	26	13	26	6	20	11	4	15	162		
	22	18	22	20	14	23	17	16	14	13	8	15	197		
	12	21	19	19	18	24	22	22	20	20	14	11	222	1,137	25·2
16. Gillies Bros., "Argyle," Homer-street. Canterbury: Black Orpington. Market Value, £6 12s. 1½d.	26	27	16	28	18	19	20	16	19	14	13	14	230		
	0	23	25	24	25	26	16	16	16	12	10	9	202		
	15	18	24	10	19	14	22	12	13	15	17	8	187‡		
	0	10	23	25	16	19	21	12	16	0	0	0	142†		
	3	21	22	20	18	22	18	15	21	17	13	15	205		
	0	20	6	17	18	16	15	17	19	13	10	11	162	1,128	24·2
17. L. Jones. Fairfield-road. Old Guildford: Black Orpington Market Value, £6 12s. 11¾d.	20	23	27	27	24	23	16	26	14	18	20	14	252		
	23	26	25	24	28	26	25	20	18	12	14	23	264		
	7	23	21	1	18	14	21	10	12	16	1	0	144		
	7	10	7	23	18	18	18	13	7	0	0	0	121†		
	19	27	20	22	18	17	15	11	14	16	9	12	200		
	4	17	23	22	18	20	15	3	0	0	0	0	122	1,103	24·7
18. C. Bloomfield, "Wide View," Alpha-street, Willoughby: Black Orpington. Market Value. £6 11s. 10d.	21	21	19	17	17	5	5	1	0	0	0	0	106†		
	12	22	22	23	27	28	28	17	16	24	13	12	244		
	15	26	28	21	26	24	26	22	23	12	15	15	248		
	8	28	21	22	19	4	0	1	0	0	0	0	103		
	11	26	25	24	25	25	21	24	19	25	17	3	245		
	9	19	7	24	26	27	21	2	1	5	0	0	141	1,087	26·2

* Bird replaced; score struck out. † Bird died; not replaced.

Seventeenth Annual Competition—*continued.*

Section B (Heavy Breeds)—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Individual Totals.	Group Totals.	Weight per dozen
19. R. M. Griffiths, Forest-road, Bexley: Rhode Island Red. Market Value, £6 2s. 2½d.	19	0	0	5	25	17	21	19	18	13	5	7	149		oz.
	6	17	5	13	10	22	23	22	10	20	6	16	170		
	22	21	23	23	23	19	16	9	18	9	12	15	210		
	22	22	20	22	25	26	14	2	0	0	0	0	153†		
	10	1	24	24	23	26	24	10	20	3	11	0	176‡		
	0	19	24	25	25	26	28	18	17	13	4	15	214	1,072	24·7
20. Exchange Poultry Farm, Murray-road, Carlingford: Silver Wyandotte. Market Value, £6 0s. 3¾d.	0	0	7	24	26	26	26	10	16	19	5	22	181		
	15	27	23	20	19	13	17	18	17	10	18	20	217*‡		
	0	8	21	17	4	8	16	14	13	9	11	10	131		
	0	8	22	27	21	11	23	18	9	15	19	11	184		
	10	20	19	18	21	23	21	13	14	15	19	9	202		
	0	0	0	19	23	24	24	14	12	18	9	12	155*	1,070	23·7
21. R. Hardcastle, Kogarah: Black Orpington. Market Value, £5 15s. 2¾d.	0	0	1	19	26	26	25	16	14	12	11	12	162		
	1	0	0	9	20	19	16	16	13	14	6	9	123		
	0	6	7	1	10	12	13	12	11	12	4	3	91		
	8	21	22	24	21	26	23	23	24	23	17	21	253		
	14	21	21	23	22	25	25	22	22	22	13	0	230		
	16	21	18	19	15	23	23	12	18	16	6	12	199	1,058	26·2
22. C. E. Banks, Gibson-avenue, Central Bankstown: Langshan. Market Value, £5 15s. 2¾d.	9	0	1	25	30	28	28	19	22	19	8	20	209		
	0	12	22	19	25	28	19	14	16	15	12	11	193		
	18	13	18	24	25	24	21	17	10	8	0	0	178		
	0	10	21	4	20	14	14	2	0	0	0	0	85†		
	0	13	21	13	22	17	16	17	16	11	11	0	157		
	14	24	26	26	27	26	17	21	14	16	13	0	224	1,046	25·7
23. W. Markwell, Pittwater-road, North Ryde: Black Orpington. Market Value, £6 3s. 1d.	21	26	25	24	5	0	0	0	0	0	0	0	101†		
	0	0	0	3	17	24	20	19	15	16	11	12	137		
	10	0	24	25	25	15	22	16	14	15	12	12	190		
	11	22	23	23	24	15	22	18	11	12	18	11	210		
	9	26	23	22	21	20	19	15	16	17	11	14	213		
	7	9	24	23	24	22	22	9	6	21	14	9	190	1,041	24·2
24. Fetherston Bros., Ballengarra-road, Miranda: Black Orpington. Market Value, £6 3s. 8d.	13	7	15	15	16	17	18	16	16	15	6	9	163		
	11	23	5	9	4	14	21	8	12	14	9	4	134		
	7	19	23	22	24	22	23	8	17	14	8	13	200		
	16	24	21	23	23	13	0	0	0	0	0	0	120†		
	0	16	24	23	23	20	24	12	21	24	17	18	222‡		
	6	24	19	21	23	23	22	16	5	16	6	17	198	1,037	24·5
25. J. England, Wharf-road, Dundas: Buff Orpington. Market Value, £6 0s. 1½d.	18	0	0	20	16	21	8	10	12	12	3	7	127		
	20	7	18	20	23	16	14	10	10	12	9	9	168‡		
	18	8	23	20	21	21	17	10	10	0	0	1	149		
	20	23	22	22	23	24	23	12	11	18	3	20	221		
	15	17	27	22	20	22	20	14	14	12	12	14	209		
	2	16	3	25	10	14	13	14	12	12	11	12	144	1,018	24·0
26. J. F. Dalrymple, "Loloma," Forest-road, Peakhurst: Rhode Island Red. Market Value, £5 7s. 2¾d.	9	24	21	23	20	23	21	13	17	19	7	20	217		
	0	0	10	16	21	26	23	21	22	8	8	18	173		
	0	4	21	21	23	26	25	14	25	11	8	21	199‡		
	18	21	18	16	22	23	23	18	12	16	1	7	195		
	0	16	5	18	8	21	18	13	15	14	7	5	140		
	0	7	5	2	1	2	0	0	2	19	0	0	38	962	26·0
27. W. Abrams and Son, Malton-road, Beecroft: Black Orpington. Market Value, £5 1s. 3¼d.	0	0	19	21	2	24	11	14	17	15	10	10	143		
	12	18	23	21	23	25	23	14	14	14	15	14	216		
	0	5	25	22	6	15	19	16	13	15	3	20	159		
	0	0	0	10	24	24	24	10	18	16	0	13	139		
	0	0	1	19	21	24	14	14	20	16	7	18	154*		
	0	5	22	4	13	14	20	15	12	13	12	2	132	943	25·0
28. F, J. Sanderson, Sixth-avenue, Hyde Park, Lidcombe: Rhode Island Red. Market Value, £4 12s. 0¾d.	21	20	19	21	26	28	28	17	17	24	13	20	254		
	14	4	0	0	7	11	1	2	6	19	14	2	80		
	0	0	9	10	18	21	15	10	12	10	0	0	96		
	7	6	1	5	10	20	14	11	11	11	9	10	115		
	18	0	0	0	14	22	24	22	5	16	6	0	127		
	6	8	19	13	18	25	24	24	23	15	0	10	185	857	25·2
29. A. Tye, "Tyeston," Norman-street, Peakhurst: Rhode Island Red. Market Value, £4 15s. 1¼d.	18	21	16	17	19	22	20	20	17	17	6	2	195‡		
	2	0	0	6	22	24	18	13	14	12	14	8	133		
	4	0	19	17	0	0	0	0	0	0	0	0	40†		
	5	10	15	17	21	20	18	21	18	0	8	9	162		
	21	16	27	27	16	18	21	17	19	18	9	13	222		
	7	3	2	0	14	18	21	18	15	5	0	0	103	855	27·2
30. H. H. Hazlewood, Ray-road, Epping: Plymouth Rock. Market Value, £4 4s. 4¾d.	0	0	0	0	17	26	21	22	20	15	11	20	152		
	0	0	20	18	1	0	0	0	1	0	0	0	40		
	0	0	16	23	25	26	16	12	19	10	1	17	165		
	2	0	5	23	27	24	15	12	21	17	6	23	175		
	0	0	21	25	26	21	16	9	9	19	9	1	156		
	1	0	5	22	14	16	14	13	10	10	10	12	127	815	24·0

* Bird replaced; score struck out † Bird died; not replaced.
‡ Bird ineligible for individual prizes; eggs under weight.

Remarkable Influx of Impure Seed.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

DURING the month of March large quantities of seed were imported into this State from New Zealand, amongst which were many of the dirtiest consignments ever inspected under the quarantine regulations. The average number of very impure consignments inspected in a year is about twelve, but this number was exceeded in the single month mentioned above. So dirty were they that orders were given to have the seed cleaned before it was released from bond, but it is extremely doubtful if some of the noxious weed seeds present can be removed by existing machinery. If this doubt is well grounded, it would be advisable to deport the various consignments concerned rather than distribute over the State the various harmful weeds contained therein.

The reasons for this remarkable influx of impure seed are obscure. It may be that various seedsmen, troubled by the serious shortage in existing stocks of various seeds, have not adopted the usual precautions in oversea purchases, and have been content to obtain their stocks from careless growers; or it may be that the war has been the cause of serious deterioration in New Zealand, and weeds have gained the upper hand in what were originally clean, well-kept fields. In any case, the opinion can be unhesitatingly expressed that Australian farmers are laying up for themselves a serious amount of trouble, if seed such as that imported is sown in their paddocks.

One of the worst of weed seeds and the commonest present was sorrel (*Rumex acetosella*). In two consignments of rib grass, this seed was present in alarming proportions. The sowing of rib grass alone for a pasture is not advocated by the Department. It is now far too common in South Coast pastures, and if desired it will certainly come, and that without farmers being at the trouble of sowing it. But the appearance of a paddock after sowing rib grass with 10,000 sorrel seeds to every pound can well be imagined.

Another remarkable feature noticed in the seed imported was that large consignments of seed labelled "Clover" seed were found on inspection to consist of inferior varieties. In one case there was 79 per cent. of Suckling clover (*Trifolium dubium*) and 15 per cent. of White clover, plus noxious weeds; while in a second case there was 90 per cent. Suckling clover and 4 per cent. White clover. Suckling clover is a slender annual that is never advocated by good farmers for sowing in pastures. If this seed, therefore, is sold as clover seed, the farmer gains very little; while if sold as White clover seed, the seedsman is probably liable to prosecution under common law. In both these cases again sorrel seed was present in astonishing proportions.

A consignment of Alsike clover contained something like 15 per cent. of Red clover seeds, plus noxious weeds. Red clover cannot, of course, be classed as a noxious weed, but when a farmer buys Alsike clover he does not want Red clover, for his land may be suited to one and unsuited to the other. If the Red clover dies, bare patches are left which, if the seed were pure, would possibly have been filled by Alsike clover.

A consignment of Fescue grass was found to be badly infested with ergot, a fungus which, if swallowed by dairy cattle, is likely to produce abortion.

Many of the rye grass consignments were impure. In one parcel labelled "Perennial rye" grass a large quantity of Italian rye grass was found to be present. As the latter is an annual grass, its presence in seed of a perennial grass is undesirable. Conversely, large quantities of Perennial rye grass were found in Italian rye grass, though this, of course, is not such a disadvantage as if the reverse were the case.

The accompanying table shows the purity per cent., and the number of weed seeds per pound in some of the worst samples.

TABLE showing Purity per cent. and Number of Weed Seeds per lb.

Seed.	Percentage of Pure Seed	Principal Weed Seeds present.	Number of Weed Seeds in 1 lb. of the Seed.
Rib grass	93·5	Sorrel	3,200
		Dock	256
		Corn thistle (*Cnicus arvensis*)	64
		Yorkshire Fog grass	192
		Sherardia arvensis	128
		Wire weed	192
		Suckling clover	5,760
		Chickweed	128
Clover (79 per cent. Suckling clover, and 15 per cent. White clover).	79*	**Sorrel**	**51,200**
		Spurry	3,200
		Yorkshire Fog	960
		Fat Hen	384
		Rib grass	512
Clover (94 per cent. Suckling clover, and 4 per cent. White clover).	94*	**Sorrel**	**20,800**
		Dock	64
		Rib grass	1,920
		Self Heal	800
		Fat Hen	128
Lotus major	95	Dodder	256
		Sorrel	1,664
		Sedge	9,000
		Rib grass	9,800
		Suckling clover	7,280

* Being percentage of Suckling clover in the samples. If the White clover be assumed to be pure seed here is 6 per cent. of weed seeds in the first of these two samples, and 2 per cent. in the second.

TABLE showing Purity per cent., &c.—*continued.*

Seed.	Percentage of Pure Seed.	Principal Weed Seeds present.	Number of Weed Seeds in 1 lb. of the Seed.
Lotus angustissimus	96	Sorrel	6,400
		Yorkshire Fog	3,800
		Suckling clover	14,800
		Rib grass	640
		Sedge	8,400
Tall fescue	99·5	Pigeon grass	64
		Ergot (fungus)	·5 per cent.
Clover (96 per cent. Suckling clover, 2 per cent. White clover).	98	Sorrel	3,840
		Yorkshire Fog	2,560
		Rib grass	512
		Chickweed	512
Prairie grass	91	Dock	800
		Goose grass	832
		Barley grass	96
		Twitch grass (*Triticum repens*)...	128
		Cocksfoot grass	1,920
		Sterile Brome grass	32
Cocksfoot grass	99	Dock	256
		Sorrel	320
		Rib grass	32
Alsike clover	83	Rib grass	192
		Fat Hen	192
		Chickweed	64
		Pigeon grass	1,130
		Sorrel	64
		Dock	64
		Red clover	**112,000**
Red clover	98	Pigeon grass	1,600
		Sorrel	32
		Dock	192
		Corn thistle	128
		Rib grass	352
		Timothy grass	1,376
Cocksfoot grass	98·8	Rat's Tail fescue	2,304
		Sweet-scented Vernal grass ...	64
		Cat's Ear	1,368
Rye grass (90 per cent. Perennial and 9 per cent. Italian).	99*	Sorrel	256
		Rat's Tail fescue	64
		Cat's Ear	320

*The balance over the Perennial and Italian rye grasses represents 1 per cent. of weeds.

Poultry Notes.

MAY.

JAMES HADLINGTON, Poultry Expert.

THE most important work of this month will be mating up the breeding stock, and generally making all preparations for the hatching season.

During the early part of the month all the hens and pullets intended as breeders should be got into the breeding pens, so that they can get settled down before the coldest weather starts. The male birds may be put in at once, or a little later, but the aim should be to have eggs to set by the first week in June. Fertility may result from the fourth day after mating, but it is often the ninth day before the maximum fertility is reached. Disappointments are usually met with at this early stage in the season, and particularly so where aged birds are being relied upon as breeders. Few eggs and poor fertility are the rule, particularly with heavy breeds, at this time of the year, but it should be understood that, from the point of view of breeding stock, each chicken hatched in July is worth two hatched a month later. Distinctly better development is obtained from the July chick (other conditions being equal), and the birds are, or should be, fit to breed from the following June The results of early hatching thus become cumulative, enabling the breeder to secure the maximum number of early-hatched stock.

Breed from Well-developed Pullets.

There is a fallacious notion abroad that only second-year hens should be bred from. That this is entirely wrong has often been emphasised in these notes, and has also been amply demonstrated at Hawkesbury Agricultural College, where every year we breed from quite as many pullets and cockerels as second-year hens and cocks. Hatching operations proper commence on the 1st June at the College, and are continued to the end of September; but the birds hatched during the six weeks from the last week in June to the first week in August are the best stock to breed from in the following year, and July-hatched birds are the most valuable of all. Those who visit the College during the months of February to May, when the bulk of the young stock is still there, will appreciate the good development obtained. In fact, the opinion has been almost unanimously expressed that nothing finer is to be found in the State, and yet by far the larger number of these early birds are bred from cockerels and pullets.

Similar results can be seen on some private farms where the same practice is followed, and the writer has used cockerels and pullets in the same way for many years with entirely satisfactory results in the matter of physique. The notion that cockerels and pullets are not old enough to breed from, springs from the practice of many who have bred from immature or badly reared birds, which, as common sense would indicate, are not fit for the purpose.

One of the ways by which many in the poultry industry are to be saved from trouble or failure is by raising a greater proportion of early-hatched stock than is common at the present time, and this is not possible when only second-year or aged hens are being used as breeders, *for the simple reason that they do not, as a rule, lay sufficient eggs early enough in the season.* If we wish to verify this assertion, let us turn to the performances of the hens. in the second-year section of the competition at the College—all of them selected high-producing hens. It will there be found that our expectation of eggs from second-year hens in June is six per head, while that from pullets is sixteen per head—a difference of ten eggs for that month in favour of the pullet. [By pullet we here mean a female that is under 12 months old.] It will thus be seen that, on the basis of two eggs to one chick, the highest grade hens are unlikely to produce more than an average of three chickens from the June laying, while the pullet can produce eight chickens for the same month. In July, the average laying of the same class of hens is about twelve eggs, while the pullets average about eighteen eggs. The foregoing presumes that the eggs from young and old birds are equally fertile, which is not usually the case; in fact, the percentage of fertility is often so low as to make the results from hens and cocks in the early period almost nil. If we were sacrificing stamina for mere numbers, then one might hesitate to use the younger birds, but with well-developed birds this should not be the case.

The opinion that pullets and cockerels are not fit to breed from can therefore be dismissed as unsound. It usually emanates from those who have had experience with breeding from immature or badly-reared stock. As an indication of what is regarded as suitable birds to breed from, it might be stated that pullets and cockerels should be at least 10 months old when eggs for setting are required from them, and that the light breeds, such as Leghorns, should weigh, for cockerels, say 5 lb. to 6 lb., and for pullets, 3½ lb. to 4½ lb., and in the heavy breeds, cockerels, say 7 lb. to 8 lb., and pullets 5 lb. to 6 lb. In this connection some judgment on the part of the selector is necessary according to the condition of the bird. For instance, if a bird is in poor condition it might be 1 lb. or more lighter than the normal weight for its size. It follows, therefore, that many birds that one might reject on weight alone, might, if properly attended to before the breeding season, make up to the desired weight.

Poor Laying Results.

As is usual at this time of the year, numerous inquiries are being received relating to poor laying by both hens and pullets. In many cases there is much room for improvement; but in the majority of instances more is expected by owners than is likely to be realised at this time of the year from the class and age of the birds. Many correspondents who have, say, July and August-hatched pullets that have come on to lay more or less, entertain the expectation that the birds should be in full lay, and they arrive at the conclusion that because they are not obtaining nearly an egg per pullet per day, they are either not feeding right, or they have a bad-laying strain. In most cases both assumptions are wrong. The fact is they are getting quite as many eggs as can be expected, having regard to the general average results at this time of the year.

Then there is the complaint that second-year hens of reputed good strain have got over the moult, and have not commenced to lay many eggs. This, indicates an expectation that is unlikely to be realised. The birds will not be likely to lay many more eggs until July or August. The beginner, having this experience, without visualising what is a reasonable expectation for this time of the year, often has recourse to all sorts of advertised nostrums for making fowls lay, or comes to the conclusion that he cannot be feeding the right class of food, or that his ration is not " balanced," and makes some change in the feed that only accentuates the trouble. It would be well for the beginner to study this question from a seasonal point of view, and to find out from actual figures what are reasonable expectations of laying for the different ages—pullets and second-year hens. For instance, pullets hatched later than the first week in September rarely lay many eggs before July, while those hatched in July and August will invariably lay more or less from January on, much depending, of course, upon the development that has been secured. For instance, many flocks of pullets come under notice in which birds hatched in August show less development than others hatched a month later, and what the poultry farmer fails to realise is that this poor development and general backwardness of his pullets is due to one of two things—lack of vitality in parent stock, or bad rearing—sometimes to both. If this fact could only be brought home to poultry-keepers forcibly and action taken accordingly, how much more profitable poultry-farming would become!

Expectation of Laying.

Figures relating to the seasonal average expectations of laying have been previously published in these notes, but they are given here again, quoted from " Poultry Farming in New South Wales," with the addition of the figures of the competition which has just closed The point to remember is that these results are from selected birds, and that the average flock cannot be expected to come up to their standard.

AVERAGE MONTHLY LAYING of all First-Year Hens in Laying Competitions at Hawkesbury Agricultural College for the last four years.

	1915–16.	1916–17.	1917–18.	1918–19.
* No. of 1st Year Hens	516	420	420	420
	Eggs per head.	Eggs per head.	Eggs per head.	Eggs per head.
April	3·7	10·6	9·8	8·8
May	8·2	15·5	14·0	13·8
June	12·3	17·0	16·5	15·9
July	18·2	18·9	18·6	18·6
August ...	21·3	21·0	22·6	20·5
September ...	21·9	22·5	21·2	21·5
October ...	22·0	22·5	20·0	21·0
November ...	18·9	18·5	18·0	17·9
December ...	18·1	19·6	17·0	17·7
January ...	17·7	15·9	14·2	16·6
February ...	15·8	12·8	15·2	11·5
March ..	12·4	11·0	14·6	11·5
Totals ...	190·5	205·8	206·2	195·3

* It should be understood that these pullets are supposed to be not less than 7 months old when entering the competition on 31st March, and therefore hatched not later than August.

AVERAGE MONTHLY LAYING in the Second-Year Tests during the last Four Competitions.

	1915–16.	1916–17.	1917–18.	1918–19.
No. of Hens .	174	120	120	120
	Eggs per head.	Eggs per head.	Eggs per head.	Eggs per head.
April ...	4·1	7·4	5·0	9·7
May	2·6	5·4	3·4	5·4
June	6·0	7·0	6·4	9·4
July	14·4	13·1	11·6	12·9
August ...	18·5	19·0	17·3	16·1
September ...	19·5	20·6	18·3	18·7
October ...	20·1	21·3	17·8	18·3
November ...	18·3	17·1	16·8	15·5
December ...	17·3	18·3	16·4	15·0
January ...	16·3	15·8	14·0	14·8
February ...	13·7	11·7	11·3	10·5
March ...	10·0	8·7	9·2	9·5
Totals ...	160·8	165·4	147·9	156·8

STUD FEES FOR DEPARTMENTAL STALLIONS.

IN connection with the fees and conditions for the use of stallions at the North Bangaroo Stud Farm, Canowindra, it has now been decided that Clandale's fee be 7 guineas per mare, and Royal Warden's fee 6 guineas per mare.

Any number over two from the same owner will be charged 6 guineas and 5 guineas each respectively. Agistment, 2s. 6d. per week per mare.

Free service will be given the following season to all mares that fail to get in foal from previous season's service. No further concession will be made if the mare fails to get in foal after the second season's service.

Agricultural Bureau of New South Wales.

Suggested Subjects for Bureau Meetings.

It sometimes happens that, owing to some inadvertence, or perhaps the failure of the writer of a promised paper, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion :—

What results have you had from harrowing the growing wheat crop? Have you observed whether a crop stands a dry spell in the spring any better for such treatment? In loose soils the harrow sometimes pulls out a number of the little plants ; in your own case is that damage greater than the advantage?

Do you provide sheds for your machinery? Heavy losses are made annually by neglect of valuable machinery, but inexpensive shelter is sufficient ; what style or class of shed have you adopted? Can you give a concrete example of the life of a machine being shortened by exposure, as compared with one that was protected from the weather?

Some orchardists in dry districts have found that green manuring crops have a tendency to deprive the trees of moisture, and that it is sometimes difficult to get the crops to turn in satisfactorily in the spring. Have you had any similar experience under such conditions, or have you found it possible to meet these objections by early planting and early ploughing in?

What have you found the best season for planting oranges, lemons, and mandarins? In some districts there seems to be an advantage in autumn planting. Is that your experience?

What method of rearing calves do you adopt—the individual teat or bucket, or the trough? Does your experience suggest that the trough method communicates disease? Do you supply any form of dry feed to assist development, and if so, what?

Of all the popular utility breeds of poultry, what do you consider are best, holding their own in stamina and physique, and which seem to you to be decadent? Success or failure in hatching and rearing are valuable indications as to decadence ; what about your favourite breed in that respect?

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Bimbaya.

The monthly meeting of this branch was held on 14th March. A discussion took place on a question raised in the January issue of the *Agricultural Gazette*, as to the best dual-purpose wheat for this district.

The report on the results from the farmers' experiment plots on the South Coast was read and discussed by members. Some of the older members stated that wheat had been grown successfully in the early days of settlement, but later on rust made its appearance and wheat growing became unprofitable. The consensus of opinion was that the varieties recommended by the Department of Agriculture would prove the most successful as dual purpose wheats. For fodder purposes it was considered that oats were far superior to wheat in the coastal districts.

The annual picnic and sports gathering of the branch was held on 29th March, the affair being a most enjoyable one. The weather was fine, and everything necessary to a good day had been anticipated.

Bobin.

A new branch has recently been formed at Bobin. A meeting was held on 1st March, when the following office-bearers were elected :—Chairman, Mr. C. Parker ; Auditors, Messrs. T. S. Green and J. H. Rose ; Hon. Secretary, Mr. Chas. F. Pfeiffer.

The second monthly meeting of this branch was held on 24th March, and formal matters having been dealt with, the Chairman, Mr. C. Parker, read a paper on dairying. He touched in an interesting and instructive manner on the importance of a cow being in good milking condition when she calved, and the necessity for good feed and water. From this he went on to refer to cleanliness in milking in the bails, and in respect of all vessels in which milk and cream are placed, and the thorough washing of the separator morning and evening.

Great interest was shown in the remarks on the various influences affecting a superior or inferior article when manufacturing into butter, especially in regard to low grade cream. A discussion followed the reading of the paper, and members agreed to deal with the matter further at the next meeting.

Cotta Walla.

The annual meeting was held on 28th January, when the report showed that the meetings of the branch had been well attended during the year, and the various activities had all been marked by a gratifying measure of success. The balance-sheet showed a flourishing state of affairs. The office-bearers were elected for the ensuing year :—Chairman, Mr. D. J. Kennedy ; Vice-Chairman, Mr. W. H. Smith ; Treasurer, Mr. J. Plumb ; Hon. Secretary, Mr. T. A. Howard.

The report of Mr. R. N. Makin, Inspector of Agriculture, on the papers submitted to him in connection with the second essay competition, was read. It spoke very appreciatively of all the papers, and awarded first prize to the following by Mr. W. E. Howard on potatoes.

PRIZE PAPER ON POTATOES.

The cultivation of potatoes is a great industry, for no vegetable is more commonly grown, and a far larger quantity is annually consumed, both in the country and the metropolitan areas, than of any other vegetable. Careful attention in every operation connected with potato-growing is essential, if the best yields are to be obtained, and the raising of a big crop should be the chief aim of the grower. Cases are often seen where the work is done in a careless, slovenly manner, but invariably the results are very poor.

Potatoes require a piece of good rich red soil (new land preferred) and ploughed about 6 inches deep in the autumn ; but any cultivated land, if carefully cultivated and suitably manured, will produce splendid crops of potatoes. If old cultivation land is used for potato growing, it would benefit the crop if rye was sown on the land when ploughed first time, and when it has a good hold of the land plough it in to prevent the land from caking.

In September the land should be cross-ploughed, and harrowed afterwards to conserve the moisture. If the land is still rough and cloddy, it should be rolled.

Planting should commence early in November for this district and continue throughout the month. The late maturing varieties such as Magnum Bonum, Coronation, and Commonwealth should be planted first, for they take a long season to properly mature; then mid-season varieties such as Brownell's Beauty, Surprise, Queen of the Valley, Carman, Manhattan; then early varieties such as Early Brownell, Up-to-Date, Satisfaction, Manistee, and Early Rose.

The potatoes should be planted in rows, with 2 feet 6 inches between the rows. This method allows sufficient room to scuffle and keep the weeds down. Harrowing should be done at the end of each week's planting, so as to keep the land in a good moist condition for the potatoes to start to shoot. Cross-harrow when the potatoes are coming up. If the prospects are for a medium or heavy crop, the potatoes should be hilled when scuffled to prevent the tubers growing out and becoming green and unsaleable. Scuffling must be done before the plants flower, otherwise the yield will be greatly decreased by breaking the little roots that feed the tubers. Selecting the seed is very important; only sound seed should be kept for planting.

About 2 cwt. of P7 to the acre is considered the best manure for potatoes. This is a mixture of equal quantities of superphosphate and bone-dust, which is suitable for almost any soil. The manure should be dropped in the furrow with the sets; in this way the potato roots share more equally than if spread along the furrow. Taking the yield as 5 tons per acre realising £5 per ton, the balance-sheet may be briefly presented as below. In a 5-ton crop, 1 ton would be small, out of which ½ ton of seed may be picked.

Expenses.

	£	s.	d.		£	s.	d.
Rent	1	0	0	Scuffling and hilling	0	5	0
First ploughing	0	10	0	75 bags at 8s. per doz. ...	2	10	0
Second ploughing	0	8	0	Digging at 1s. per bag ...	3	15	0
Harrowing	0	1	3	Carting at 4s. per ton ...	0	16	0
Half ton of seed at £5 per ton	2	10	0	Freight, 4 tons at 12s. per ton	2	8	0
2 cwt. P7 at 7s. per cwt. ...	0	14	0	Commission	1	0	0
Ploughing	0	8	0	Picking 1 ton small	0	7	6
Planting	0	6	0	Balance	5	8	9
Harrowing	0	1	3				
Cross-harrowing	0	1	3	Total	£22	10	0

Income.

	£	s.	d.
Four tons at £5	20	0	0
Half ton seed	2	10	0
Total	£22	10	0

DEPARTMENTAL NOTE.—The Chief Inspector of Agriculture states that this is a very useful and practical paper, but a very important feature, the selection of seed, might have been more strongly emphasised, especially the value of seed from plants that are known to have yielded well. The success of the potato crop depends principally upon the character of the seed. Information regarding this subject can be obtained on application to the Department, so that discussions may take place in branches of the Bureau that are interested in the subject.

The branch met again on 10th February, when papers were read by Mr. T. J. Kennedy and Mr. T. A. Howard, their respective subjects being "Some Points about Milk" and "Dairying." Both were useful papers that were appreciated by those present.

At a meeting on 10th March a paper was read by Mr. J. C. Weatherspoon, from which the following is extracted.

ANALYSIS OF SOILS.

It has been frequently urged that a chemical analysis of the soil is the indispensable preliminary to successful manuring. This would appear, at first sight, sufficiently obvious, but there never was a greater fallacy. While it must be admitted that it may be some help in determining the deficiency in the necessary plant foods, chemical analysis alone is not sufficient guide to the requirements of the soil as to fertilising ingredients. The difficulties of obtaining a small sample of a few pounds' weight which will be typical of the great mass of soil contained in an acre of land to the depth of, say, one foot are great. There is also the difficulty of determining, even approximately, the solvent power of the roots of the plants of different crops, and the fact that, although all plants require the same substance for their growth and development, they only require them in proportions, but possess varying powers of absorbing them from the soil. Chemical analysis informs us how much plant food a soil contains, but unfortunately it does not indicate what portion of this plant food is in an available and useful form. Plant food must be available to be useful, and a soil might contain an abundance of a particular plant food, and yet the application of manure containing that food might give very profitable results. All farmers should know that of the substances commonly called plant foods, phosphoric acid, nitrogen and potash, with lime also under certain conditions, are the ingredients essential for complete fertilisers. Large quantities of these plant elements are usually present in all cultivated soils, most of which, however, are in an insoluble condition, and are, therefore, unavailable and useless to the crop. The soils may contain, as shown by chemical analysis, large supplies of plant food, and still fail to produce crops for the lack of it in an available form. It is, therefore, obvious that the only direct and practical way of ascertaining the crop-producing power of the soil is by making field experiments. Chemical analysis has shown that the average analysis of a fertile soil indicates the presence of 5 tons of nitrogen, 4 tons of phosphoric acid, and 5 tons of potash to an acre-foot of soil. A crop of wheat yielding 13 bushels of grain to the acre, or about 1 ton of grain and straw, will remove from the soil each year, if both grain and straw are removed, about 21 lb. nitrogen, 10 lb. phosphoric acid, and 22 lb. potash. This might indicate that it is necessary to supply all three plant-food elements when measuring a wheat crop. Agricultural practice over the greater portion of the wheat areas has shown that if the land is fallowed the application of superphosphate alone is necessary to produce profitable crops. The combined result of extended experiments in the Commonwealth has proved that, whilst analysis suggests that both nitrogenous and potassic manures are necessary, this application does not increase the yields as much as one would suppose. As a matter of fact, although a complete fertiliser sometimes gives a slight increase of crop, the cost of it is such that it is generally found to be more profitable to apply superphosphate only ; and if the same value in superphosphate alone were applied, it might be generally depended upon to give a better commercial return than any complete fertiliser containing nitrogen, phosphoric acid, and potash. In the analysis of soils we therefore have an example of the difficulty that sometimes happens of reconciling theory and practice. It should not be inferred from the foregoing remarks that we absolutely condemn the analysis of soils as being of no value ; indeed, we firmly believe that a comprehensive scheme of soil survey and analysis would save many settlers from serious loss. What we wish to emphasise is that analysis alone is not a reliable guide of any soil requirements in the way of fertilisers, and that plot and field experiments are of far greater value.

The Cotta Walla branch staged a non-competitive exhibit at the Crookwell show recently, which attracted a great deal of interest, being examined by large numbers of people. The exhibit contained samples of different kinds of wheat, oats, rye, barley, grasses, maize, millet, wool, fruit, vegetables, and seeds.

Cunningham.

A meeting was held on 14th March, when a paper on fodder crops and methods of utilising them, was read by Mr. B. J. Stocks. The sowing of rape in combination with barley or King's Early wheat was recommended, and it was stated that if the seed-bed was in first-class order, seed sown at the end of February or early in March would be ready for grazing towards the end of April, provided there were a few showers to germinate the seed and bring the growth along. It should be eaten down repeatedly, but with care as to management in turning the stock in.

Dural.

The members of this branch have discussed several of the subjects suggested for the purpose in the *Gazette*, and the Secretary forwards the following report of the conversations :—

January Question *re* Cultivating the Orchard in Summer.—It was thought advisable to work the orchard once a month in summer time. The spring-tooth cultivator, the spading harrow, and the disc harrow are extensively used in this district with very satisfactory results. These implements can be worked close to the trees, so that a very small portion of the orchard is left untouched. The plough with shifting handles is coming into favour, and is being used fairly extensively. This implement reduces the chipping work in an orchard by about 50 per cent. To get the best results it needs to be used with the patent orchard harness.

February Questions *re* Green Manuring and Packing.—Grey peas and barley are recommended for green cover crops for this district, barley being given preference. The best time to sow both is March. Fertilisers are used for the green crop to the extent of about 3½ cwt. per acre of blood and bone manure. Both straight and diagonal packs are used, according to the size of the fruit. As a rule the diagonal pack is only used for difficult sizes. Wrapping is not practised generally in this district.

March Questions *re* Grading Apples.—Apples here are generally packed in three grades. Growers grade for size only, and do not state on the case the number of apples therein contained.

Kellyville.

A meeting of this branch was held on 3rd April, when it was reported that the branch's exhibit won first prize at the Castle Hill show held on 28th and 29th March. The exhibit was sold at the conclusion of the show and realised £4 4s. 3d., which amount, after deduction of expenses, was forwarded to Parramatta District Hospital.

Lidcombe.

A meeting was held on 24th March, thirty-six members being present. Mr. W. W. Edwards read a paper entitled "Useful Garden Hints," in which he strongly emphasised the importance of rotation of crops. The cultivation and after-attention of cauliflower, cabbage, parsnip, peas, beetroot, Brussels sprouts, beans and tomatoes were touched upon to the advantage of members.

Lower Portland.

The monthly meeting took place on 31st March, when a lengthy discussion took place concerning the local agricultural show. Owing to the prevailing epidemic, and also to climatic conditions being most unfavourable during the summer, it was decided to abandon the exhibition.

Orangeville

A meeting of members was held on 17th March, when Mr. A. Boot addressed members on the objects of the Fruit Growers' Association of New South Wales, also on fruit-packing and case-making. A long discussion took place on the possibilities of getting a railway, as the district is well suited for fruit-growing—especially citrus fruits.

At the annual meeting the following office-bearers were elected :—Chairman, Mr. R. H. Taylor ; Vice-Chairman, Mr. C. Duck ; Treasurer, Mr. J. Petrie ; Auditor, Mr. E. Marden ; Hon. Secretary, Mr. W. J. Anqilley.

St. John's Park.

The annual meeting of this branch was held on 21st March. The Secretary reported that ten meetings had been held during the year, seven lectures having been given. The balance-sheet showed the satisfactory credit of £3 7s. 6d.

Stockinbingal.

The annual meeting was held on 5th April, and there was a good attendance of members. The balance-sheet showed a credit of £6 15s. The following gentlemen were elected office-bearers for the ensuing year:—Chairman, Mr. Alex. Gilmour; Vice-Chairmen, Messrs. B. Wisenden and J. Loiterton; Hon. Secretary and Treasurer, Mr. John Neville.

Walla Walla.

The annual meeting was held on 1st March, and the following office-bearers were elected for the ensuing year:—Chairman, Mr. A. J. Went; Vice-Chairman, Mr. M. Crawford; Hon. Secretary, Mr. H. Smith.

There are good reasons for anticipating that operations will be largely increased during the year.

Wellington.

The branch met on 18th March, Mr. R. G. Harvey presiding. Mr. H. H. A. Flanagan read a paper on the rearing of chickens, from which extracts follow.

THE REARING OF CHICKENS.

In dealing with this all-important subject one must see that the breeding pens are properly mated and are kept under suitable conditions to ensure strong healthy germs, otherwise all the advice in the world will be of little use. The next thing is to see that the eggs from the breeders have proper treatment before and during hatching. If this is not watched you are sure to meet with trouble during the rearing of the chickens. I would advise you to watch the hatching, and don't be in a hurry to remove the chicks from the incubator to the brooder for at least 24 hours after they have left the eggs. Before removing the chicks from the incubator to the brooder, be sure and see the brooder is nice and clean, you cannot be too careful in this matter. Before placing the chickens in the brooder cover the floor with nice clean, sharp sand, and allow it to be warmed up for at least a day beforehand. Test it by placing the back of the hand on the sand and round the heater, and if you find that it is just comfortably warm then you will know it is just right to receive the chicks. It is as well always to remember that chickens need warmth, and there are more lost by under-heating than by over-heating. At night watch and see if the chicks are well spread out; you will know then that the heat is just right. Chickens should not be given food for the first 36 to 48 hours from the time of hatching. They should be given a run on fine, sharp sand and grit; this being taken to the crop and from there to gizzard, is ready to reduce the food given at the first meal. The first meal I generally give is a good brand of rolled oats, and after a couple of days some toasted bread, which is moistened with milk, the milk being squeezed out of it, and give them as much as they will eat up in about 10 or 12 minutes. This will do with the addition of finely-chopped-up soft green grass, or lettuce, with charcoal, grit and water always before them, and if you have any sweet milk to spare give them some. The kind of tin I use to give them water is, half a 2 lb. tin with the top cut out of it, and make a couple of holes, say, with a No. 10 nail, about a quarter of an inch from the top, then fill it, and fit a tea saucer over the top and turn it down. Your tin is then full, and may be set on a piece of wood 1 inch thick and 3 inches square. This is so that the chicks will not trample sand in or anything you may have on the floor; a faint colour of permanganate of potash in the water is a great help in keeping the chickens' health in order. After the third day give them a little of the morning mash that you have prepared for the fowls. You will notice after the first day of the mash they will look forward to it. The chickens will be all the better for a run on a grass plot, but see that the grass is not wet, and chickens will stand a considerable amount of cold provided there is no wind. I would suggest to the beginner that chickens should be fed about six times a day, as follows, after the third day:—6·30, rolled oats with a small tin of bran always before them, the bran keeps the chicks in good health; 8 a.m., a little wet mash; 12 noon, rolled oats and chicken mixture; 2 o'clock, wet mash; 4·30, rolled oats and chicken mixture. This plan of feeding is continued until the chicks are about four weeks old. Much depends how the chicks thrive whether it is continued or not. When they are about six weeks old they are removed to fresh quarters, and are fed similar to adult birds. They are given free range, where they can get their own green feed. In conclusion, if everyone who has to care for chickens would study their needs, feed them properly, see that they are free from lice, and use a little commonsense, they would not have so many chickens dying. Don't keep dosing delicate chickens; the way I cure them is to hit them on the head and they are cured for ever.

DEPARTMENTAL NOTE.—The Poultry Expert remarks that milk is best given to chickens by mixing the mash with it. If milk is given them to drink, great care is necessary to prevent the birds getting into an insanitary condition, because they wipe their beaks on the down—a practice that is particularly objectionable with brooder chickens. It is not necessary to use the rolled oats after the first two days.

Wetherill Park.

A meeting of this branch was held during the last week in March, when a discussion took place on vegetable growing, with special reference to tomatoes and cabbages. Members obtained some useful information with regard to Black Spot on the tomato, and the treatment necessary to prevent it.

The Secretary states that a good quantity of vegetables is grown by farmers in the off-season in this district.

Windsor.

The first annual meeting was held on 14th March, when there was a good attendance. The annual report disclosed marked progress since the inauguration of the branch, and showed that much valuable work had been accomplished. Members expressed their thanks to the Under Secretary for Agriculture in not failing to furnish a lecturer whenever asked in connection with matters pertaining to agriculture. Gratitude was expressed by almost every member to the Secretary who had steered the branch through its first year so successfully.

The balance-sheet showed a cash balance of £4 11s. 1d. The election of officers resulted as follows:—Chairman, Mr. C. W. Farlow; Vice-Chairmen, Messrs. J. W. Mitchell, Alderman C. Jeffreys, and Geo. Davis; Hon. Secretary and Treasurer, Mr. W. H. Spinks. The branch is marked by great activity, and another useful year seems to be opening.

Woonona.

This branch held its monthly meeting on 8th April. Papers on manures and manuring were read by Messrs. G. Fowler and E. Thomas. Mr. Fowler dealt with the question from a theoretical point of view, quoting different authorities on the composition of mineral manures, and making special reference to large deposits of nitrate of soda in Chile.

Mr. Thomas, on the other hand, gave his practical experiences. He stated that he got the best results from the use of animal manures in conjunction with mineral fertilisers. The papers were very interesting and much appreciated by members.

Yass.

As a result of special efforts on the part of several growers in the district, this branch is about to become more active. Quite a number of new members have been enrolled, and the following office-bearers have been elected for the ensuing year:—Chairman, Mr. R. J. Hannah; Vice-Chairman, Mr. C. Chambers; Treasurer, Mr. W. Thompson; Hon. Secretary, Mr. C. N. Howard.

The branch proposes to meet on the second Saturday in each month, and the annual subscription has been fixed at 3s. per member.

THE HOME-MADE HIVE.

As many apiarists prepare home-made hives during the winter it is advisable to consider the manner in which they should be constructed, for it means so much as regards easy manipulation later. Good construction of the hive is practically the basis of successful management in the case of a beginner. The usual fault in construction is that the hives are not made to a standard or interchangeable size; this causes such inconvenience to the would-be progressive apiarist, that after a time he finds it necessary to transfer his bees to a more efficient and convenient hive. We find in other cases where the hives are interchangeable, that the spacing for the frames is at fault: too much space is left in the frames between the supers, or between the side bar and end board of the hive. This will induce the bees to build a considerable amount of burr comb, and cause difficulty in manipulation and damage to the frames: in addition, the temper of the bees is severely tested. Insufficient space allows protection for pests such as wax moths, for the bees cannot attack them; the manipulation will be equally as difficult as with overspacing, and often many bees will be crushed during manipulation of the supers or frames. The disadvantages mentioned do much toward destroying the interest of the beginner in the business.

It is always preferable to use factory-made hives; but if there is a reason for desiring the home-made article, the apiarist should obtain at least one of factory make as a guide. Then take all measurements correctly; purchase the frames, make use of comb foundation before the bees are placed in the hive, and have a sound cover and bottom board.—W. A. GOODACRE, Senior Apiary Inspector, Government Apiary, Wauchope.

CHARACTERISTICS OF A GOOD POTATO.

IDEALS for a perfect potato will change in the different localities. Certain attributes, however, are universally desired. These are as follows:—

1. High yield.
2. Good quality.
3. Disease-resisting capabilities.
4. Good keeping qualities.
5. Good colour of flesh and skin.
6. Skin of desirable texture.
7. Tubers of good shape.
8. Shallow eyes, relatively few in number.
9. Maturity in season common to the variety.
10. Upright vigorous plants.
11. Heavy leaf cuticle.
12. No tendency to make second growth.
13. Trueness to type of variety grown.

—A. W. GILBERT, in "The Potato."

Orchard Notes.

MAY.

W. J. ALLEN.

Preparations for Planting.

IF any land intended for planting this season is not already ploughed and subsoiled it should be done without delay, so that planting of deciduous trees can be completed during June. When such trees are planted early, the new root growth which they throw out during June and July will be helping to establish them in their permanent places. The order should have been placed with the nurseryman much earlier in the season, so as to procure the first pick of trees.

Dormant Buds.

The wraps on buds either on nursery stock or old trees may be removed.

Woolly Aphis.

As during the busy time of the fruit season this pest generally makes headway, it is a good thing to clean up the trees as soon as time will allow. In doing this the spray should be applied at a high pressure, and the nozzle held close to the affected parts of the tree. As this necessitates using large quantities of mixture per tree, it is advisable to use tobacco wash, or one of the commercial tobacco extracts, not an oil spray.

Codlin Moth.

The bandages should be left on apple and pear trees for some time after the crops are picked. As the cold weather comes on, many of the grubs will shift from other sheltering places to the bandages, where they can be more easily found and killed.

Fruit Fly.

In districts where fruit fly is liable to be found, a watch should be kept amongst the early citrus varieties and the poison pollard bait put out, as has been described in previous notes.

Harvesting.

In some of the later tableland districts the harvesting of late varieties, such as Yates and Granny Smith, will hardly be completed. The winter crop of passion fruit will be coming in, and the fruit should be regularly picked as it reaches its proper colour.

Drainage and Odd Jobs.

This is generally looked upon as a slack time of the year, and any patches of the orchard that have previously shown that they require draining should receive attention. Where agricultural drain-pipes cannot be secured at a reasonable price and rock is plentiful, underground drains can be made of broken stone.

During the busy time one often has to put off work that is not immediately necessary, and very often when a slack time does come these jobs are overlooked. It is a good plan to keep a sheet nailed on the wall on which these deferred jobs are noted, and the list can be looked through whenever a slack time occurs.

Citrus Trees.

Where frosts are liable to occur, citrus trees which have been planted within the last two or three years should be protected with bushes or sorghum stalks early this month.

Pruning.

Where loquats have completed blossoming and the setting is heavy they should be thinned by removing some of the shoots where they are too crowded. As these trees are continually spreading out, an endeavour should be made to work back where possible towards the parent branch. The bunches of fruit may also be thinned. A longer period of ripening can be obtained by removing the fruit from the apex of the bunches in some trees and from the base of the bunches in others.

Though it is safer to leave the pruning of deciduous trees until later, on account of the risk of a warm spell occurring, where an orchardist is likely to be pushed for time he may start on some of the apricots, peaches and Japanese plums, which shed their leaves early.

Starlings.

A number of starlings were shot at Bathurst Experiment Farm orchard lately, and the contents of their stomachs examined. These showed both grass seeds and apple flesh, the latter predominating. There is no doubt that these birds have caused the destruction of thousands of pounds' worth of fruit in the State this season.

Packing.

There have been many requests at recent packing demonstrations that charts should be published showing the numerical packs, in order that beginners may have an opportunity to get accustomed to them at a time when they are not so busy as earlier in the season. The accompanying notes are suggested from the errors most commonly made by learners at the Department's orchards, and from questions asked at demonstrations.

Range of Size.—The range of size is, perhaps, most easily explained by taking an example. For instance, a 2¼ inch fruit is one with a transverse diameter of not less than 2¼ inches, and if sizing to a quarter-inch range its transverse diameter is not greater than 2½ inches. Similarly a 2½ inch fruit is one with its transverse diameter not less than 2½ inches, and not greater than 2¾ inches, and so on. If the sizing is reduced to one-eighth inch range, a 2¼ inch fruit is one with its transverse diameter not less than 2¼ inches and not greater than 2⅜ inches. By the same token, a 2⅜ inch fruit has a transverse diameter of not less than 2⅜ and not greater than 2½ inches, and so on.

Now it will be seen that even when the sizing is reduced to ⅛ of an inch there still must be a range, and the largest fruit in one size may be the same size as the smallest in the size above.

Methods compared.—Under the old method of packing, the fruit was broken up into specified sizes, with a range, of course, either before or during packing, and those specified sizes had to be packed. This entailed the use of many packs, viz., square, wedge, 2–1, 2–2, 3–2, &c., and often the breaking or combining of two packs in a case to bring it to a correct height. For instance, a case might be packed with so many tiers on the wedge pack or perhaps the 3–2 pack on edge (cheek or side), and then the last two or three tiers might have to be packed 2–2 on the flat, to bring it to the correct height. Different packers, and even the same packer, would pack the same sizes of the same varieties in different ways or combinations at different times. Under the systematised method of numerical packing *the first thing is to forget specified sizes* and to choose sizes of fruit that will pack. This does not mean that mixed sizes are packed in the case, for the fruit is kept just as uniformly within a range of size as under old methods. Nor will it prove that some sizes remain unpacked. Each pack contains several counts and each count absorbs a certain range of size. This will be brought out more clearly when dealing with each pack separately.

Fruit divided into a chosen specified size may not suit the various counts of the pack, but the same fruit divided into a different set of sizes with the same range (but with the range starting and finishing at a different point) would pack quite satisfactorily. This is somewhat analagous to a quarter-hour service of a train or tram; one service may run at the hour, and at fifteen minutes, thirty minutes, and forty-five minutes past the hour, while another may run at three minutes to the hour, and at twelve minutes, twenty-seven minutes, and forty-two minutes past the hour; both, however, are still quarter-hour services. In the same way two different sets of sizes may both have 0⅛ inch ranges, notwithstanding that one starts and finishes at a slightly lower point than the other.

It is not necessary for the packer to know the sizes for the various counts; indeed, if he persists in adhering to a chosen specified size it may hinder him, for he may pick the wrong size to suit the count. Later it will be shown how the first tier fixes the size to be used in the count.

The Numerical Pack.—The packs adopted for the numerical system are the 2–1, 2–2, 3–2, and occasionally the 3–3 for the Australian bushel case, and the 2–2, 3–2 and 3–3 for the modified Canadian bushel case. These are used as true space packs, *i.e.*, the fruit in a tier above is packed into the spaces of the tier below, so that no fruit is placed directly on top of that immediately below it. Each of these packs is so called from the number of the fruit that are used in rotation in the rows across the case to form them. But each of these packs contains several counts, the counts being controlled by the number of fruit taken to complete the longitudinal rows. The number of longitudinal rows in each of these packs is the same as the number of fruit taken to form the first two rows across the case. Thus 2–1 pack contains three longitudinal rows, 2–2 pack contains four longitudinal rows, and the 3–3 six rows.

In the Australian bushel case the 2–1 pack with its various counts takes sizes of fruit large enough to pack high enough in spaces in five tiers. The 2–2 with its various counts takes sizes large enough to pack high enough in spaces in six tiers. The 3–2 with its various counts takes sizes large enough to pack high enough in spaces in seven tiers. After a couple of days continual packing of a certain variety one will know instinctively whether the size he is picking up will pack 2–1, 2–2, or 3–2, but the learner, or even an old packer at the commencement of the season of any variety, may require some guide. No guide can be given that is an actual rule of thumb, but the following is helpful :—If there is room for two apples of a size to be placed "flat" (on end) across the case, but not room for a third of the same size, this size will pack 2–1 if it will give the desired height in five tiers packed in spaces, either "flat" (on end) throughout or "on edge" (cheek or side) throughout. Try for the former by placing five apples of the size "flat" (on end) *one on top of another* up along the end of the case. If in the lower counts (larger sizes) the fourth apple should come about level with or slightly above the top edge of the case, or if in the higher counts (smaller sizes) of the pack the fifth apple projects about half or slightly less above the edge of the case, the pack will come high enough packed in five tiers *in spaces*. If, when testing in this way on the flat (on end), the height is not considered sufficient, try the five apples on edge, in a similar manner.

CHART FOR AUSTRALIAN BUSHEL CASE (APPLES).

Tiers.	Pack.	Number in rows.	Count.	Placing Flat Types.	Approximate Sizes for Flat Types.*	Placing Long Types.	Approximate Sizes for Long Types.*
					in. in.		in. in.
5	2–1	x 3–3	45	On Flat ...	3¾ to 4 ...	....	....
5	2–1	x 4–3	53	,, ,, ...	3¾ to 3⅞ ...	....	....
5	2–1	x 4–4	60	,, ,, ...	3⅝ to 3¾ ...	....	....
5	2–1	x 5–4	68	,, ,, ...	3½ to 3⅝ ...	....	....
5	2–1	x 5–5	75	,, ,, ...	3⅜ to 3½ ...	....	....
5	2–1	x 6–5	83	,, Edge (open)	3⅜ to 3½ (bare)	....	....
5	2–1	x 6–6	90	,, ,, (closed)	3¼ to 3⅜ ...	On Edge (closed)	3⅛ to 3¼
5	2–1	x 7–6	98	,, ,, ,,	3⅛ to 3¼ ...	,, ,, ,,	3 to 3⅛ (full)
5	2–1	x 7–7	105	,, ,, ,,	3 to 3⅛ (full)	....	....
6	2–2	x 4–4	96	....	....	On Edge (open)	3 to 3⅛ (bare)
6	2–2	x 5–4	108	On Edge (open)	3 to 3⅛ (bare)	,, ,, (closed)	2⅞ to 3
6	2–2	x 5–5	120	,, ,, (closed)	2⅞ to 3 ...	,, ,, ,,	2¾ to 2⅞
6	2–2	x 6–5	132	,, ,, ,,	2¾ to 2⅞ ...	,, ,, ,,	2⅝ to 2¾
6	2–2	x 6–6	144	,, ,, ,,	2⅝ to 2¾ ...	,, ,, ,,	2½ to 2⅝ (full)
6	2–2	x 7–6	156	,, ,, ,,	2½ to 2⅝ (full)	....	....
6	2–2	x 7–7	168	....	....	....	....
7	3–2	x 4–4	140	....	....	On Edge (open)	2½ to 2⅝ (bare)
7	3–2	x 5–4	158	On Edge (open)	2½ to 2⅝ (bare)	,, ,, (closed)	2⅜ to 2½
7	3–2	x 5–5	175	,, ,, (closed)	2⅜ to 2½	....	2¼ to 2⅜
7	3–2	x 6–5	193	,, ,, ,,	2¼ to 2⅜ ...	....	....
7	3–2	x 6–6	210	....	....	....	....

*NOTE.—These sizes are only approximate; notes appearing later will explain why, and also how the changes from one pack to another, and from open to closed pack, may vary in different districts, according to the shape of the apples.

The 2–2 is employed for sizes that will not quite fit in three across, or when three will fit across a case and four of the same size will not, and provided the desired height is given in six tiers packed in spaces. The same method can be used to test the height as for 2–1, using six instead of five apples.

The 3–2 is employed when three apples of a size will fit across the box, but five will not, provided the desired height is given in seven tiers packed in spaces. The height can be tested by the guide given for the 2–1, except that seven apples of a size should be used instead of five.

This matter will be further dealt with in these notes next month.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1919.

Society.	Secretary.	Date.
Central Cumberland A. and H. Assocn. (Castle Hill)	H. A. Best	Date to be fixed.
Cootamundra A., P., H., and I. Association	N. Gardner	,,
Queanbeyan P. and A. Association	J. G. Harris	May 6, 7
Cobargo A., P., and H. Society	T. F. Kennelly	,, 7, 8
Upper Manning A. and H. Association (Wingham)	D. Stewart	Cancelled.
Moree P. and A. Society	A. U. Ezzy	May 21, 22, 23
Richmond River A., H., and P. Society (Casino)	—	,, 28, 29
Parkes P., A., and H. Association	G. W. Seaborn	Aug. 20, 21
Forbes P., A., and H. Association	E. A. Austen	,, 26, 27
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 26, 27, 28
Corowa P., A., and H. Society	J. D. Fraser	Sept. 2, 3
Narandera P. and A. Association	J. Faulkner	,, 9, 10.
Albury and Border P., A., and H. Society	F. J. Belbridge	,, 9, 10, 11
Young P. and A. Association	T. A. Tester	,, 9, 10, 11
Manildra P. and A. Association	A. Anderson	,, 10
Northern A. Association (Singleton)	J. T. McMahon	,, 10, 11, 12
Culcairn P., A., H., and I. Society	J. B. Ryan	,, 16, 17
Ganmain A. and P. Association	T. S. Henderson	,, 16, 17
Temora P., A., H., and I. Association	A. W. Ness	,, 16, 17, 18
Canowindra P., A., and H. Association	H. M. Brown	,, 23, 24
Murrumburrah P., A., and I. Association	W. Worner	,, 23, 24
Holbrook P., A., and H. Society	J. S. Stewart	,, 30, Oct. 1
Deniliquin P. and A. Society	P. Fagan	Oct. 1

1920.

Kiama A. Society	G. A. Somerville	Jan. 24, 26.
Southern New England P. and A. Association (Uralla)	H. W. Vincent	Feb. 24, 25, 26
Armidale and N.E. P., A., and H. Association	A. McArthur	Mar. 16, 17, 18, and 19.

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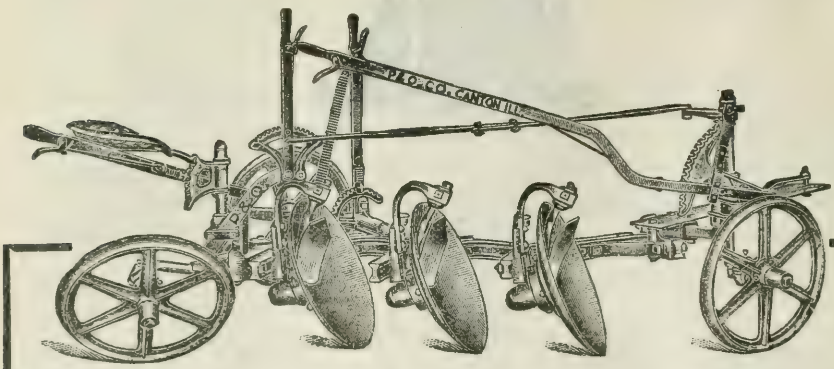
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2nd June, 1919.

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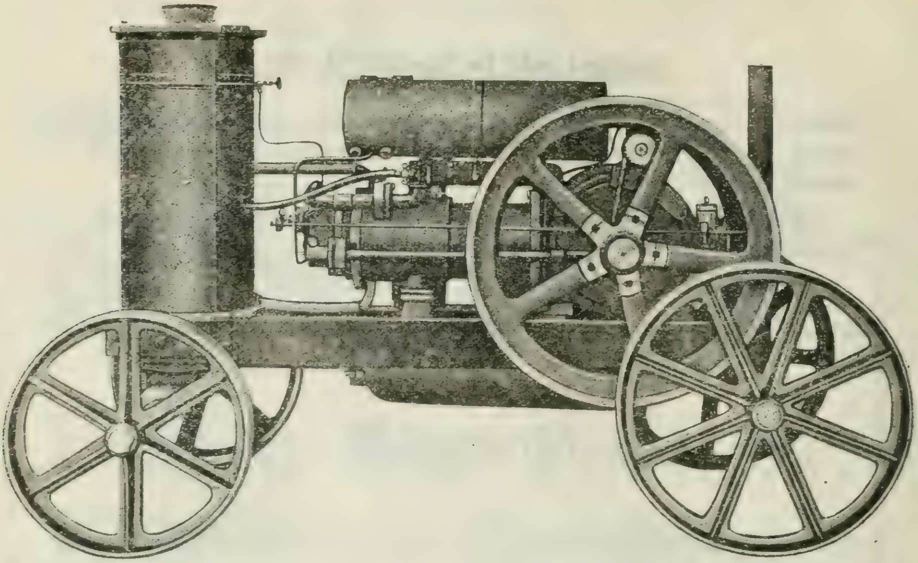

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VOL. XXX. PART 6. JUNE 2, 1919.

Agricultural Gazette of New South Wales.

Land Clearing by Explosives.

[Continued from page 167.]

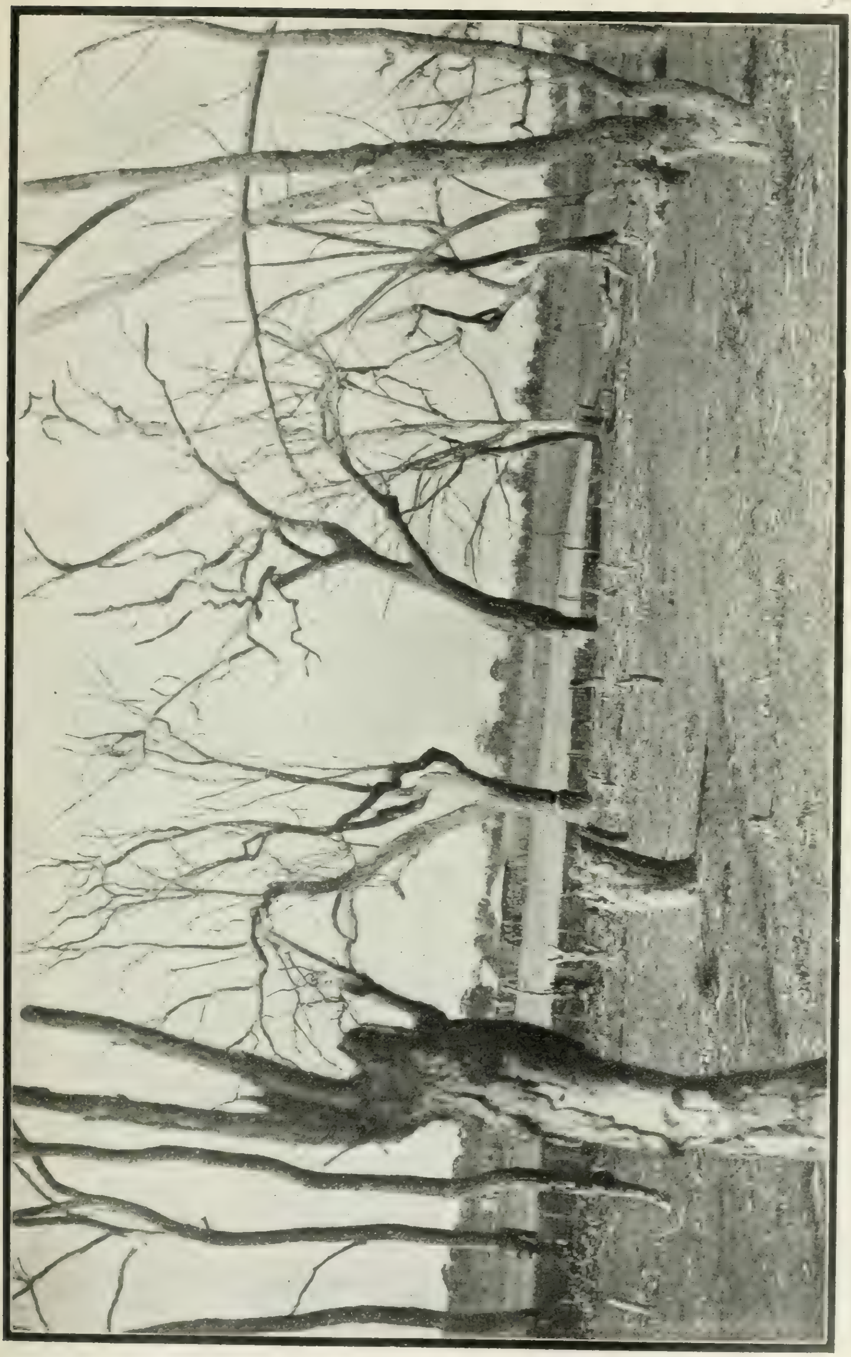
C. W. BURROWS, Field Assistant.

The Question of Co-operative Purchase.

THE question of co-operative purchase of explosives is one that might well engage the attention of such organisations as branches of the Agricultural Bureau, &c. The cost of clearing is of paramount importance to farmers, just because so much of it has to be done before crops or cultivation of any kind can be planted or taken in hand. It almost invariably falls to the lot of the small settler to find heavy clearing ahead of him, and as he usually has not too much capital at his disposal he has to do his clearing by the old method of hand-grubbing, &c., in what he is pleased to call his spare time. This often suits well enough; but if the price of explosives was more reasonable it would be possible for many such settlers to do, at any rate, the heavier work with the aid of explosives, at the saving of much labour and time. At present the local storekeeper who has an explosives license and magazine is the distributing agent, and he will charge anything from 7s. 6d. to 12s. 6d. for a 5-lb. packet of gelignite, 10s. to 12s. 6d. for a box of 100 No. 6 detonators, and up to 1s. 6d. per coil for fuse in lengths of 24 feet. For the explosives alone this figures out at from £3 15s. to £6 5s. per case of ten packets of gelignite, totalling 50 lb. Frequently a reduction of 10s. to 20s. per case of 50 lb. will be made if a full case is taken, but this concession is rarely of any value, as the farmer may only require half a case, or even a couple of packets just at that time.

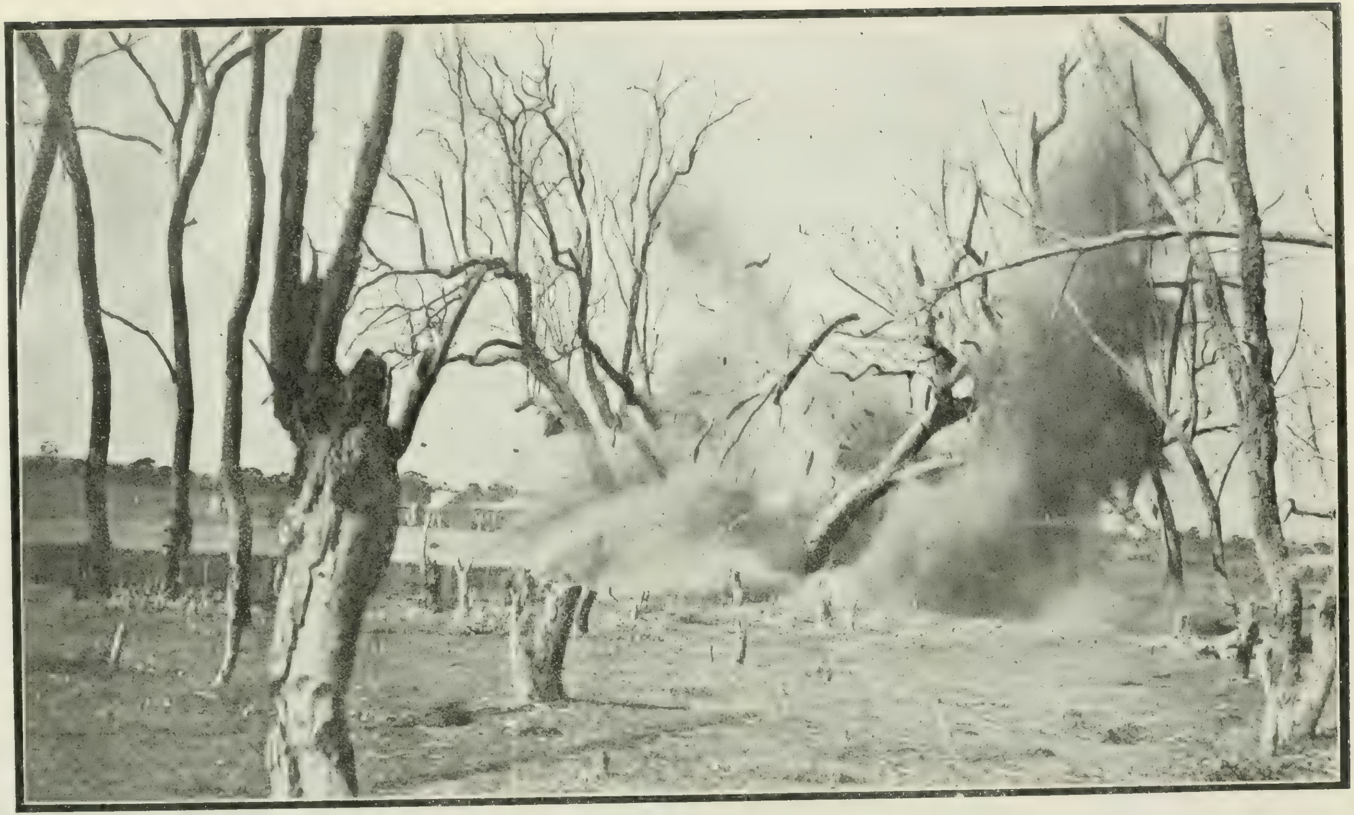
When we come to consider that under contract this same gelignite can be purchased for about 46s. per case of ten packets, totalling 50 lb., that No. 6 detonators are 7s. 6d. per box of 100, and fuse at 9d. per coil of 24 feet, and that explosives are carried on the railways at 1s. per ton per mile, with a minimum freight charge of 7s. 6d., the question naturally arises—would it not be a far better scheme in every way if the various branches of the Bureau whose members are likely to be clearing to any extent, were to take out a license, have a magazine, and supply members at contract prices? The license could be taken out in the name of the secretary of the branch, and would cost 10s. per annum, and it would allow up to six cases, or 300 lb. of explosives, including detonators, to be stored. The magazine could be home-made, and yet answer all the conditions and requirements of the Explosives Act, being constructed out of a sound section of a hollow log, large enough to accommodate the 300 lb., having brass lock and hinges, and no iron or steel nails inside, and being placed in an excavation in a bank or hillside, in such a way that it is secure from damp and soakage waters. Such a magazine could probably be made for about £1. It would need to be inspected by the local police officer, who is an inspector under the Act, before the license was granted, as it must be located at certain distances from buildings and public roads. Under the Explosives Act, 1905, anyone is allowed to keep up to 25 lb. of explosives, including detonators, on his own premises without a license, but for 25 lb. a farmer would have to pay the local agent's high price. Hence it is that it would be better for members of such organisations as that mentioned to deal in case lots, up to the capacity of the license and the requirements of the members, and to arrange for purchase under contract. The contract is not a very drastic document, as it does not bind the contractor to take any specific amount of explosives during the currency of his contract—in fact, he need not take any at all; but it does provide that if he should procure any it must be purchased from the firm with whom the contract is signed. Some branches of the Bureau have already done this, and a few have also purchased a firing battery outfit, renting it out to its members at so much per day or week. Such a battery is not essential, however, as very successful work can be done without a battery in these days, when th object is to prepare timber for burning by shattering it.

The application of explosives to the various methods of clearing, from shattering for burning to the blowing right-out of stumps and trees, varies so widely—what with the different root systems, variety of timber, soil conditions, &c.—as to make it next to impossible to give a concise description in writing of just where to place the charges, and just how much explosive to use. For this reason the Department has arranged for numerous demonstrations (and is still prepared to arrange for more) at which the whole subject is treated in the field and explained both in operation and in effect and results. A certain variety of tree may "tap" very badly in one district, and may make no tap-roots at all in another; or the soil may be strongly resistant, with a good stiff solid subsoil for shooting off, and everything in favour of good results in one place, or it may be sandy and friable, and offering but little resistance in another. Such cases need to be tackled rather differently, so that the beginner, after he has mastered the handling and preparing of the charges, &c., and has thereby gained confidence, has to study many points if he is to succeed in keeping down the cost of his clearing, never using the axe if gelignite will do the job quicker and better, or *vice versa*, and never using two plugs if one will be enough. It may look fine to see billets of wood, splinters, and dust flying around the area, but it will certainly prove an expensive pastime. Attention is drawn to this because in the early days of clearing with explosives it was invariably the custom, if not actually to blow everything (stumps and trees alike) right out of the ground, at least to go as near as possible to it by using heavy charges. If the farmer succeeded the question naturally arose, where was the earth coming from to fill the hole? If, on the other hand, the tree or stump was not blown to splinters, it was looked upon as a very expensive failure, for the farmer fully realised that



The Forest Giant

LAND CLEARING BY EXPLOSIVES.



THE EXPLOSION

Under modern conditions considerably less explosive is used, splitting—not blowing out—being now the objective.

LAND CLEARING BY EXPLOSIVES.

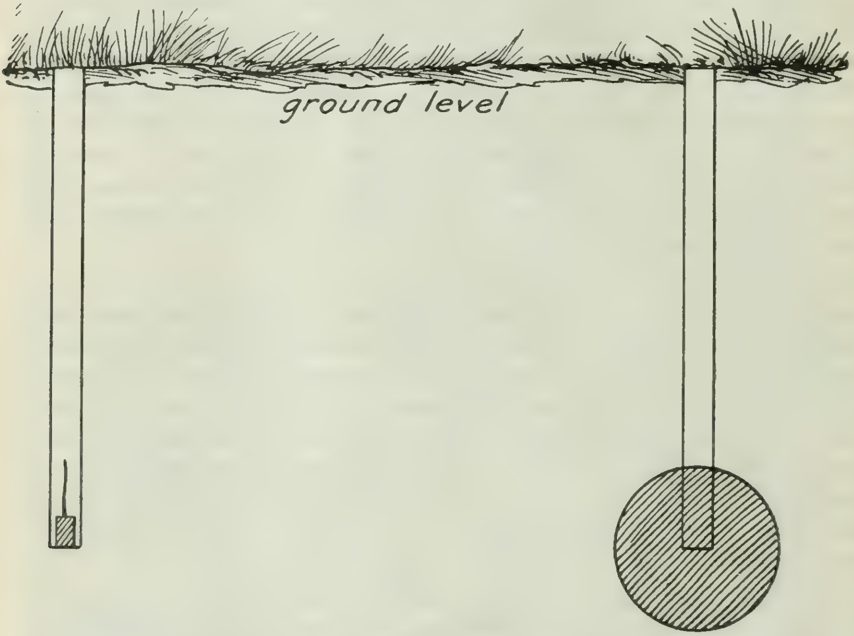
it was only a question of putting sufficient explosives underneath the largest tree growing to blow it right out of the ground. But with experience came reason, and now it is not only recognised, but strongly advocated, that to split and burn is the proper procedure, and it is this method that the Department favours.

On most areas the stump question looms large, and in describing the method of handling the stump, the handling of the tree is also described in general principles, since one is the same as the other, except that the trunk and branches have been removed.

It may be taken almost as an axiom that charges should never be placed by means of auger or bulb bar holes in sandy ground or under hollow stumps, that is, stumps with, say, a hollow of a foot or more in diameter. In such cases the charges should be placed by means of the chisel bar close under the hip roots and where the stump is held the strongest, so that the gelignite is resting right up against the timber in a bunch. This ensures the maximum of shattering. The amount of the charge depends wholly on the mass of timber to be shattered; it is next to impossible to lay down hard-and-fast rules as to the amount of charge to be used where such wide variations are the rule rather than the exception.

If a battery is being used, all the charges will be fired at the one time and together, but very good results can be obtained by placing one charge and firing it with ordinary fuse; then preparing another charge hole, the position of which will be dictated to a large extent by the results of the shattering of the first charge, in conjunction, of course, with the next heavy hip root. The work can be continued thus right round the stump, until it is shattered satisfactorily for burning. This is where the grub-hole application of charges is ahead of the auger or bulb-bar application, since a charge put in with the latter would so loosen up the whole soil area of the stump as to make it quite impossible to place another auger or bulb-bar charge under it.

In handling strongly-rooted solid stumps of, say, up to 3 or 4 feet diameter, the auger or bulb-bar can be employed with advantage for a one-charge and ordinary fuse job, but it is advisable to put this hole down quite 4 feet and well under the centre of the stump. The reason for putting this hole down so deep is that the explosive force of the charge travels at a definite and regular angle towards the point of least resistance, which naturally is the surface soil; consequently the deeper the charge is placed, the wider will be the range of the explosive force, and the greater will be the total area of root-system affected. A point in manipulation which might with advantage be used to a much greater extent, and the effect of which is plainly noticeable when grub-hole charges are used, is that of bunching the charge. By this is meant putting the several plugs that comprise the charge in one lump, instead of, as in a bulb-bar hole, distributing them to a certain extent up the length of the hole. To accomplish this, the hole has to be what is termed "bulled"; this consists of opening out a chamber at the bottom or deepest point, by exploding a small charge of gelignite at that point before the main charge is put in position. The size of this "bulling" charge depends on the number of plugs it is intended to use in the attack upon the stump itself and the physical condition of the ground. Generally speaking, however, one-third of a plug of gelignite will open up a cavity about 6 inches in diameter every way, which will hold anything from ten to fifteen plugs. To prepare this "bulling" charge of a third of a plug and to explode it in the bottom of the hole, take a No. 6 detonator, free from sawdust packing, and insert a piece of ordinary fuse about 8 inches long in the open end and crimp it on in the usual way with pliers; then, after making a hole with the handle of the pliers or a piece of stick in the piece of a plug, push the detonator with fuse attached into the hole and split the top end of the fuse so as to expose the powder to facilitate lighting. So soon as the fuse is lit and the powder flame spits out, drop the charge quickly into the bulb-bar hole and push it down to the bottom with the tamping stick, then remove the tamping stick and stand to one side, as the explosion throws out a certain amount of dirt and compressed air straight in front. No tamping of any kind is to be used in this operation, as it is not necessary. After the explosion, push the tamping stick down into the "bull" to make sure everything is clear, before putting the final charge in; if necessary, clean out the hole with the earth



"Bulling" a Hole.

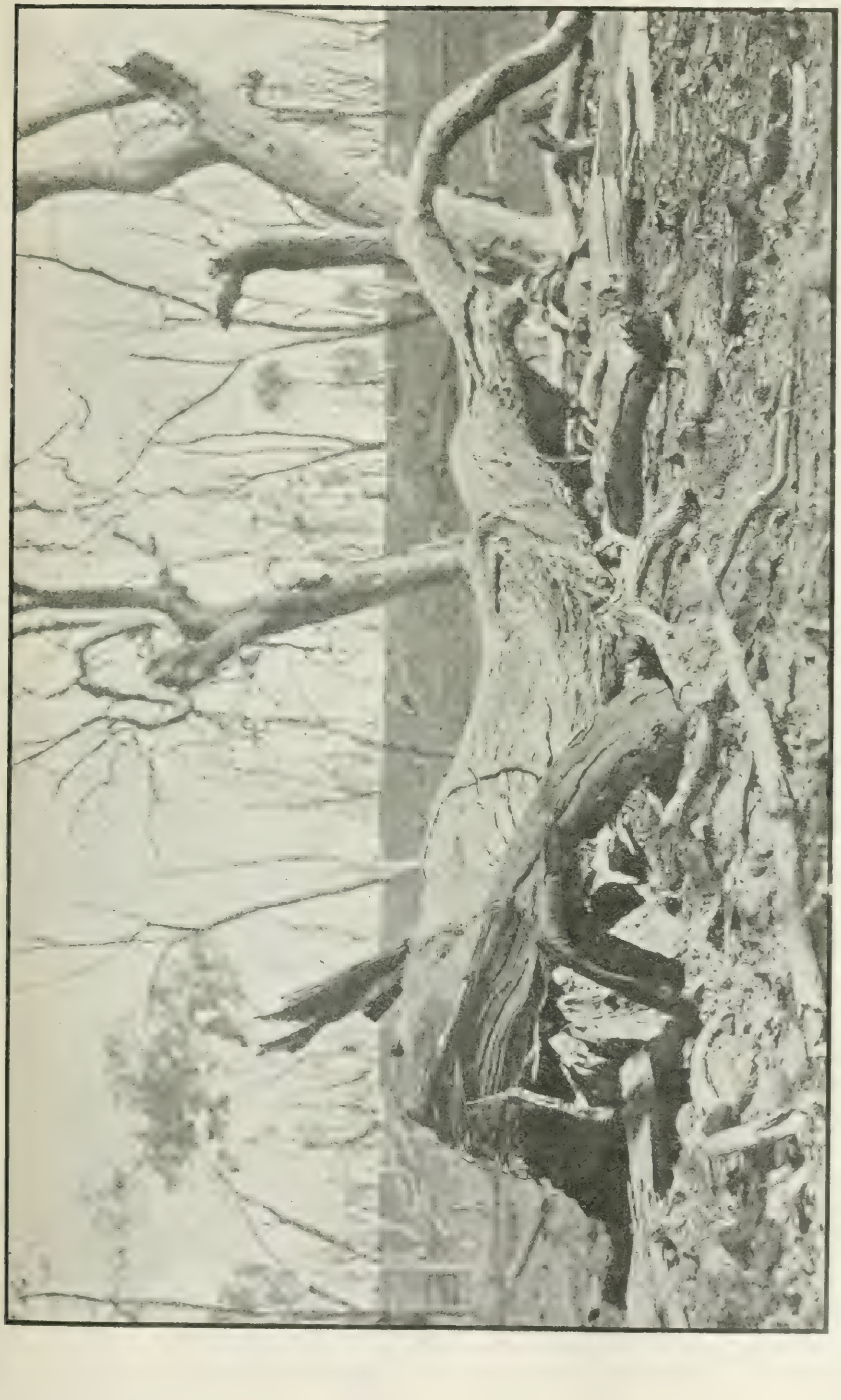
A small charge of, say, one-third of a plug is first exploded at the bottom of a hole driven with a bar, and in the chamber so created ten to fifteen plugs can be placed as the "business charge."

auger and proceed to drop the charge in, one plug at a time, pushing each plug down into the "bull" chamber with the tamping stick; lastly the primer—the plug with the detonator and sufficient length of fuse attached—is put in gently and pressed home. Now get a wad of paper—any sort will do—and make a ball about the size of a fist; hold the fuse firmly in place with one hand, and press this paper wad down into the hole to a depth of about 3 feet, or two-thirds of the depth of the hole, taking care that the primer is not drawn out from contact with the rest of the charge, while holding the fuse. Having fixed the paper wad firmly, drop in a few handfuls of loose moist earth; tamp this very gently until it is firm and solid, and is not moving the paper in the hole; then add more earth and tamp it until the remainder of the hole is full of well-tamped earth. To facilitate the lighting of the fuse, cut a diagonal snick in the top end, right into the powder core, and into this insert a small wedge-shaped piece of gelignite; this ignites quickly when the match is applied and is not easily blown out by the wind. The reason for using the paper wad when tamping is that ample air space may be left in the region of the explosion; the effect of such an air chamber is to slow down markedly the rapidity of the action of the gelignite when it explodes—an effect that is of importance, both in regard to the wider area covered by the explosion and also the more economic use of gelignite. It is not advocated as a general thing that green or growing trees should be blown out, because of the sweetening of the soil that goes on in a more definite way while timber is dying than if green timber is removed at once. The increased cost due to live trees having a much stronger hold and consequently requiring more explosives must also be considered. It sometimes happens, however, that it is necessary, or at least advisable, to remove green timber. In such cases better results can probably be obtained by firing the charge electrically, putting down three or four holes, so placed round the tree as to do the lifting where the rooting indicates it to be necessary. In this case all the holes should be about 4 feet deep and "bulled," and the same precautions as to tamping and using the paper wad should be adopted, as previously described; then after connecting up the wires of the various charges "in series," round the tree, leaving one wire from the first and last charge to be connected to the twin wire firing cable, lay this firing cable in the direction of the sun, so that when the operator comes to exploding the charges with the battery, he will be facing the tree with the sun at his back. Should the explosion throw pieces of timber or stones in that direction, he then will have a clear vision and no glaring sun in his eyes to interfere with him in any movement that may be necessary to avoid injury. The cable is 100 yards long, and it is advisable to use the full length and to get right out in the open if possible. The practice of getting behind a near-by tree should not be encouraged, as it may happen that a flying piece of timber may be hurled into the branches of the tree and may be diverted sufficiently to fall upon someone there, or it may strike a dead limb overhead and bring it rattling down. Being well out in the open offers many advantages as to safety.

After firing the charges, disconnect the cable ends from the battery terminals at once, and twist them together: take the galvanometer to the tree just blown out and pick up the other two ends of the cable and by placing one on each of the galvanometer terminals, test the cable as to whether any flying timber or stones have broken the continuity of either of the internal wires. This is the time to discover breakages, and not when just about to fire the next batch of charges. In locating a breakage, should there be one, the injury to the outer insulation will frequently be a guide, but by taking the cable in the fingers of each hand and slightly bending it while running along it from one end to the other the breakage can be detected. The outer covering must be cut lengthways, the two insulated inside wires separately exposed, and the broken ends fixed by twisting a piece of naked detonator wire on to each broken end, thereby bridging the fracture, and the repair covered with some insulation tape, so as to prevent contact with the other wire, and also to prevent moisture from affecting it. As this operation often necessitates the splitting or cutting of the outer insulation for 2 or 3 inches, further insulation tape must be twisted round the cable proper to cover and protect the repair.

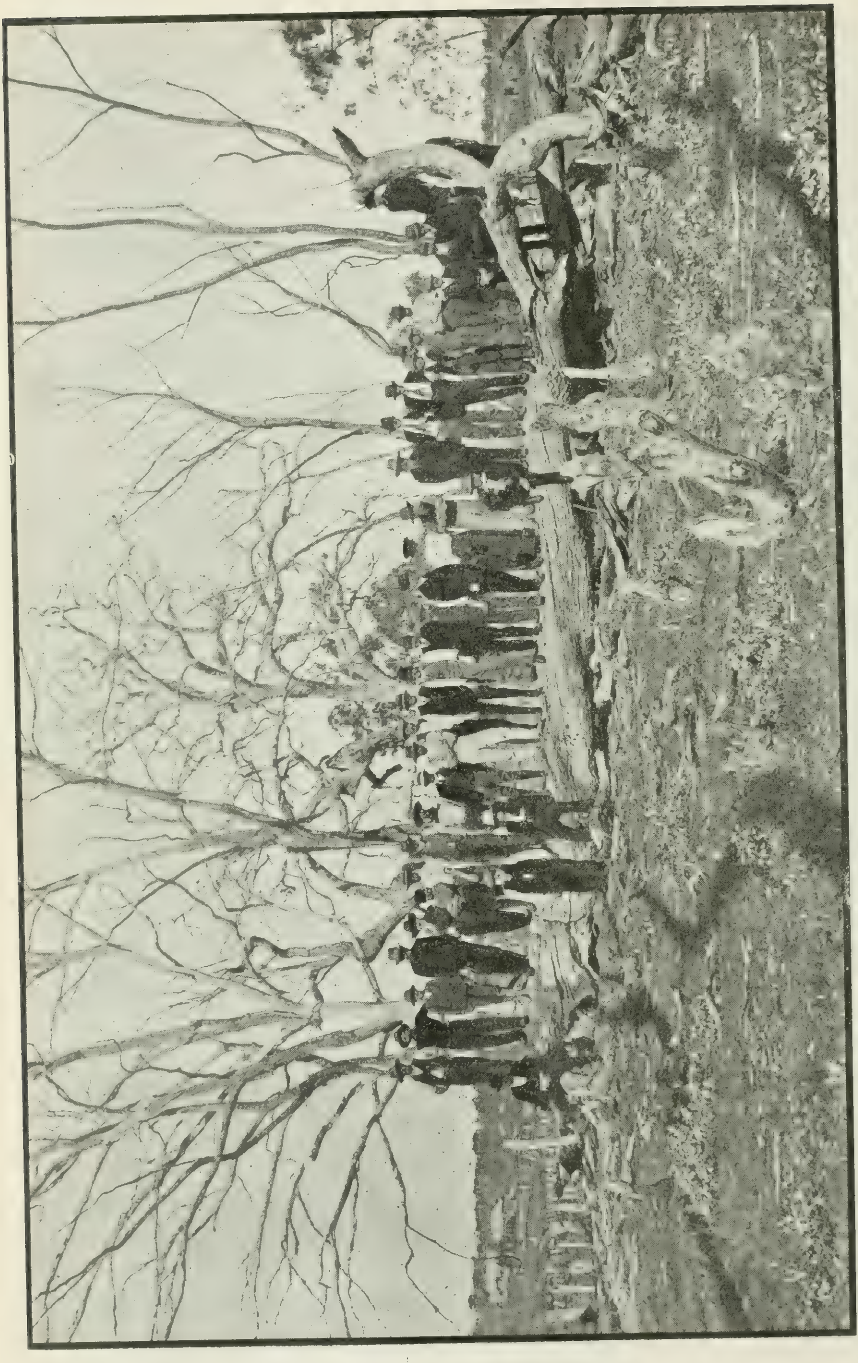
It is frequently found that an otherwise solid tough stump of 3 or 4 feet diameter has a pipehole of perhaps a couple of inches, or may be 6 inches, across, and filled with decayed vegetable matter offering fair resistance. With the earth auger or bulb bar put a hole down the pipe, so that the charge will be at least on a level with the ground—a bit below is better—and into this put up to five plugs including the primer (the one with detonator and fuse attached); tamp well, and use the piece of wedge-shaped gelignite to light the fuse end with, remembering that fuse burns at the rate of about 2 feet per minute. Logs frequently have similar pipes, but the difficulty there is to get the hole beyond the charge sufficiently solid to prevent the explosion from blowing right through and out the other end; at times, however, it is possible to get a good basis against which the charge can blow off, and a satisfactory shattering results.

In handling solid logs, a hole should be bored from the side as centrally as possible, so as to equalise the burden both ways (diametrically, not longitudinally), and about two-thirds of the way through, standing on the ground to bore, as that is easier than on top of the log. Bore the first hole about 6 to 8 feet from the stump end, unless the timber is exceptionally curly and a bad splitter, when the hole should be closer to the stump end. Charge the hole with from two to five plugs (including primer) according to the diameter of the log, the greater number being for logs of, say, 4 feet. It will be noticed, after firing, that the splitting has extended for a distance of, say, 8 feet beyond the hole on the end of the log away from the stump, and in the direction of the spot where the next hole is to be. As this first shot split 8 feet beyond the hole, it is fair to conclude that the next one will do so also; the second hole should, therefore, be bored 16 feet away from the first, or 8 feet beyond the extremity of the first split, and it should be treated in just



"Down and Out."

LAND CLEARING BY EXPLOSIVES.



Some idea of the size of the tree may be gathered from this illustration.

LAND CLEARING BY EXPLOSIVES.

the same way as to the charge, unless very excessive shattering took place in the first explosion. Operations should be continued on this line until the whole log is handled. Of course, if a battery is available, all the charges can be fired at once, with some saving in gelignite perhaps, but one needs some previous experience in splitting the logs of the district in which you are working if you are to derive the full benefits of electric log splitting. Personally, I favour the ordinary fuse method for log work, as a big saving in explosives can frequently be effected by working from the split of the previous shot. On the other hand, what one log has done is no guarantee as to what another may do; and in working with the battery all the charges must go in at once, so that there is no opportunity of varying the charge to the behaviour of a first explosion.

Dead trees are handled in the same manner as stumps (and without a battery) by working round the main roots, one at a time, shattering some right up against the butt, and others several feet away. The latter are handled by grubbing a hole on top of the root with the chisel bar and putting the charge right on the timber, tamping the soil down on it with the thick end of the mattock handle after the blade has been temporarily removed. Having shattered all the roots satisfactorily, the trunk can be handled in much the same way as the log was handled, by boring a hole about two-thirds through, but at an angle of about 45 degrees; a hole is easier, both to bore, charge, and tamp at an angle than horizontal. After splitting, a few days may be given to allow of the tree drying out before firing. Should the trunk be hollow, it is unnecessary to split it, as the fire will soon reach the inside when once the roots are shattered close up. With a greater realisation of the advantages of the chisel bar and a correspondingly greater use of it, together with the advantage the grub charge hole has over the auger or bulb bar hole, much of the difficulty which at present attaches to the handling of big timber without a battery might be overcome, or at least looked at without prejudice. The "bulled" hole, handled as described above, is a further big advantage, both as to the explosives saved and the results obtained.

Approximate and Comparative Costs.

Taking gelignite at 1d. per plug, ordinary No. 6 detonators at 1d. each, and fuse at 1s. per coil of 24 feet, which would mean ½d. per foot, some idea can be given of what the cost should approximate in clearing land. It will be conceded that the conditions enumerated earlier in this article are ever varying, and with them the skill of the operator, so that hard-and-fast accuracies as to costs are not so simple as one might believe. If we take as a basis of explanation a solid hardwood stump of 4 feet diameter, with 4 feet above ground, and five fairly solid hip roots, and ask how long it would take to hand-grub it, we may average down the varied replies to about a day and a half, and say it costs 15s., with labour at 10s. per day.

On the above basis, if handling it with gelignite, &c., 15s. would purchase just 180 plugs at 1d. each, but as detonators and fuse would also be required, we may deduct 1s. for detonators and 1s. for a coil of fuse, which should be ample, leaving the amount at 13s., which represents 156 plugs of gelignite. If each packet of gelignite contains fifty plugs, we have three full packets, and with them such a stump could be blown right out of sight, and instead of taking one and a half days, it would take, say, about one hour to prepare and fire.

With modifications, the system under which explosives were first introduced into land clearing in this State practically resembled the one described, and though the argument was solid, the costs were high to the farmer who figured his own labour at nothing a day, for it meant the purchasing of the explosives and drawing on his limited capital. But this stump could have been blown out for probably considerably less than one packet, and the cost would still have been too high. Hence it is that splitting and burning is advocated by the Department rather than "blowing it out of sight."

To split and burn such a stump, all the charges are best put in with the chisel bar, so as to get the gelignite right up against the timber to be split, as it is there that it gives its maximum effect. Taking each hip root singly, and having grubbed the first hole well under the heavy part of the root up against the stump, we decide to put in, say, three plugs of gelignite, which, with one detonator and a foot of fuse, would total fourpence halfpenny (4½d.). After firing this charge it may be found that excessive shattering has taken place, and it is decided to cut the charge under the next hip root down to two plugs; this, with one detonator and 1 foot of fuse, represents threepence halfpenny (3½d.). The shattering from the first charge may even have been so extensive as to allow of the second hip root being missed altogether. Presuming, however, that the two-plug charge effects sufficient shattering, and that it is decided to maintain the two plugs for the remainder of the stump, and that finally a hole is bored with the wood auger into the barrel of the stump (if it has not already been split about), and place therein two plugs, using also a detonator and 2 feet of fuse, totalling fourpence (4d.), the total explosives used for this stump (with its five hip roots) will thus be thirteen plugs of gelignite, six No. 6 detonators, and 7 feet of fuse, and the total cost 1s. 10½d. In actual practice this cost may be even further reduced.

Another way of handling this stump, which would save a little time and explosives, perhaps, though leaving the complete shattering more to chance, would be to put a bulb-bar hole down 4 feet directly under the centre of the stump, and "bull." Into this "bulling," say, ten plugs may be placed, all in one charge, and tamped with paper wad, as described on page 384. This would make the explosion utilise ten plugs, one detonator, and 4 feet of fuse, a total cost of 1s. 1d. Each method needs considering as the subject crops up, however, for both are likely to give satisfactory results under favourable conditions.

Blowing out Green or Dead Timber.

As has been explained, this is not advocated, but it may at times be advisable, and a typical case will be given as to costs, &c.

Two green box trees, with ample branch area, had to be removed. One was 3 feet 6 inches diameter at the ground level, and under it three holes were put with a bulb bar, 4 feet deep and all "bulled." The bar was driven at an angle of about 45 degrees, starting about 18 inches from the trunk, so as to locate the charge in each of the three cases directly under the part of the tree most strongly held on that side; the three holes, when "bulled," were probably all within a radius of 18 inches at the "bulled" level. Into one hole thirteen plugs were placed, whilst the other two had nine plugs each, the thirteen-plug hole being on the heavier side of tree. All these holes were tamped with paper wads, and were fired electrically, the tree being blown out and down at a cost of thirty-one plugs and three electric detonators at 3d. each, or a total cost of 3s. 4d. for explosives only; the time occupied would be about an hour.

The other tree was a "twinned" green box, some 4 feet 6 inches long by 3 feet wide at ground level, under which were placed three holes, two of which were "bulled"; the other hole was a tap-root one, and consequently could not be "bulled" in the timber. Into the tap-root hole ten plugs and into the "bulled" holes fifteen plugs each, were placed, making a total of forty plugs, with three electric detonators. In this case the tree was blown out and down at a cost of 4s. 1d. for explosives only. In both instances there was ample evidence of overcharging, the barrels being split up about 15 feet and the trees being blown several feet away from where they had been growing—a happening that is almost inseparable from blowing trees right out. It may be mentioned that for dead trees the operation would be similar in every detail, except that probably 25 per cent. less gelignite would be used.

Boulders and Floating Rocks.

These are frequently found on good farm land, and are a source of constant trouble, necessitating ploughing round them and often causing breakages to machines. With the aid of explosives they can be removed without the tedious work of drilling holes in them, by means of what is termed "plaster" charges. The number of plugs of gelignite in these plaster charges varies from, say, five to twenty, according to the size of the rock that is being handled. Very large rocks are better handled by drilling a hole in them, as only a fraction of the explosive is then necessary to break them up. In fixing these charges, one plug, with detonator and sufficient fuse attached, is placed on the rock surface, and the other plugs of the charge are placed all round and over it. The whole is kept in position by an inch thick covering of stiff plastic clay, well pressed down on to the stone round the edges. The plaster, in addition to keeping the charge in position, serves to exclude the air. Very little material is thrown about by this explosion, but the report is particularly sharp and severe as it is in the open air.

It is necessary to use a little thought in placing these charges, as the angle of fracture, which varies in different types of rock, plays an important part in the success or failure of the work.

When handling " floaters " partially embedded in the earth, it is better to clear the soil away from under them and particularly from directly below the spot where the charge is placed, so as to leave a hollow below, thereby increasing the shattering effect of the explosion.

It must be remembered that only a fraction of the gelignite used in these plaster charges would be needed if a hole was drilled in the rock, but it is not everybody that can successfully use a hammer and drill in rock, especially when that rock happens to be granite. The plaster charge is, therefore, suggested as avoiding the tedious work of drilling at the expense of a little extra gelignite.

Post-hole Sinking.

Although gelignite will render the ground soft and workable for the digging out of post-holes, it is questionable whether it is to be recommended as a general practice, as the subsequent firming and ramming is rendered very troublesome, and after a good fall of rain, posts so fixed are apt to be drawn crooked by the strain put on the wires, due to the loosening up of the ground for several feet around. Hard ground may be troublesome to work, but it is just this hardness that makes for permanent efficiency in fencing.

THE DAIRY COW AS AN EFFICIENT FOOD-PRODUCER.

" THE Committee desires to emphasise the value of cows as actual producers of food, for cows yield more human food than pigs, sheep, or cattle from the same quantity of vegetable matter, *i.e.*, 100 lb. of vegetable matter will produce more units of food if converted into milk than if converted into beef, mutton, or pork. Moreover, when her years of milk-yielding have come to an end, the cow can still be turned to the less economical use to which the above-named animals are put, viz., meat production."—*Report of the Committee on the Production and Distribution of Milk* (*Great Britain*).

" Milch cows are the most efficient producers of animal food; yet even they seldom return more than 25 to 30 per cent. of the energy-value contained in their food.

" This apparent waste is justifiable only on the grounds that most of the food supplied to these animals would not be suitable for human food, while the milk, meat, &c., which they return is, of course, highly desirable for this purpose."—*Monthly Bulletin of the Ohio Agricultural Experiment Station.*

Ayrshires at Yanco Experiment Farm.

J. M. PITT, Assistant Inspector of Agriculture.

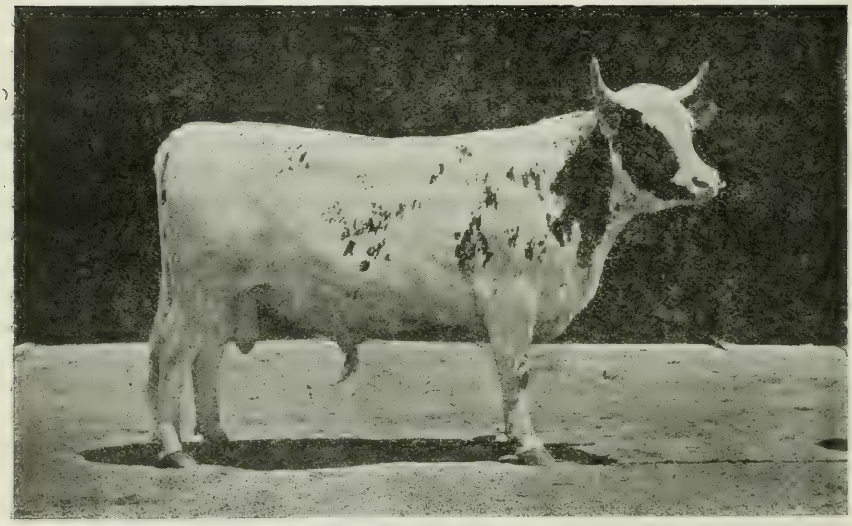
In establishing an Ayrshire herd at Yanco Experiment Farm a very necessary adjunct is being contributed to the dairying industry on the Murrumbidgee Irrigation Area. This breed of cattle has long been recognised as a type that will become rapidly acclimatised; their strong constitution, natural hardiness and grazing capabilities not only allow them to become adapted to various classes of country and climate, but enable them to produce moderate quantities of milk even under the most trying conditions.

Although it is only about two years since this breed replaced the Jerseys at the Farm, a marked improvement is noticeable in the appearance of the cows introduced from Glen Innes; furthermore, the yields have increased considerably, and the growth of the young stock—on the natural pasture alone—has been very pronounced. If a few years ago anyone had suggested Yanco as a dairying proposition, with herds likely to rival those of districts where dairying has long been established—the North and South Coast, for instance—the statement would probably have been ridiculed. Still, although the industry is in its infancy, one has only to peruse the figures from the Leeton butter factory and to get in touch with some of the dairymen themselves to realise what rapid progress has been made. Returns averaging £2 per cow per month and over for the whole year from, not one, but many herds have been quite common. Certainly the late autumn, winter, and spring rains during the past three years have been responsible for the excellent growth of natural pasturage which has made such high yields possible; but where there is such scope as here for the growth of paspalum, rye, Sudan and other grasses, maize, millets, sorghums, winter cereals and clovers, &c., under irrigation, it is possible to maintain a plentiful supply of fodder throughout the year, and it is noteworthy that the man who does grow fodders is the one who invariably tops the list, especially during the months when the natural pasturage is absent.

It may be mentioned that there are a few breeders of pure Ayrshires on the Area, some of several years' standing, and all speak highly of the suitability of the breed for the district. According to some authorities, the outstanding characteristic of the breed, namely, their extreme hardiness, can only be maintained when bred in cool climates. This idea, however, seems exploded, especially in the presence of the fine, robust, healthy-looking animals that are bred in the neighbourhood.

The cows and heifers imported from Glen Innes were all good pedigreed animals, in calf to Auchenblae of Grafton. Together with a young bull, purchased later from Mr. Pritchard's well-known Numba herd, they are to form the nucleus of the Yanco herd. This bull, purchased as a calf and named Sportsman of Kabibinokka (1832), is by Jamie of Kabibinokka (H.B. 1150), out of Madge of Kakibinokka (4528), by Victor of Kabibinokka. This cow gave 8,563 lb. milk, yielding 351 lb. butter, in 273 days. She is out of Mary III of Numba, who gave 8,419 lb. of milk, yielding 353 lb. butter, in 273 days, whilst suffering from a badly-injured udder. Both of these records were off natural pasturage.

Sportsman is a red and white bull, the red being distributed on the head and neck and slight splashes on the body. He possesses a deep, well-proportioned body, excellent backline, fine skin, and has all the other qualities necessary to become not only a bull that it will be hard to find fault with in the show ring, but also the father of some very good milking stock. Although only 2 years old, he was exhibited non-competitively at the 1918 Leeton show, and attracted much attention from both local and other well-known breeders.



Ayrshire Bull, "Sportsman of Kabibinokka" (1832)

Picture of Glen Innes, one of the most productive cows in the herd, is out of the well-known cow Lady Dado of Glen Innes (3742), by Orphan Boy. Lady Dado, whose record is well worth including, is by Dado of Grafton, out of Hawkesbury Gladys, and has had six heifers, two of whom are at Yanco, the others, including Miss Dot (5,805 lb. milk, 4·37 per cent. test, 280·17 lb. butter, in 273 days as a 2-year-old), being still stationed at Glen Innes. Lady Dado's record is :—

1st year—6,714 lb. milk,	3·6 per cent. test,	264·09 lb. butter,	238 days.
2nd year—8,273 ,,	4·6 ,,	448·47 ,,	365 ,,
3rd year—10,008 ,,	4·1 ,,	471·36 ,,	365 ,,
4th year—8,968 ,,	4·31 ,,	435·62 ,,	303 ,,
5th year—10,194 ,,	4·0 ,,	486·60 ,,	365 ,,

Thus, in five years she has given 44,157 lb. milk, average test 4·2 per cent., yielding 2,106·14 lb. butter, a yearly average of 421·22 lb. commercial butter, equal to 1·22 lb. butter for every day of the period—a most creditable performance.

Picture of Glen Innes was calved in 1913; she is a white, brown-spotted cow, of great depth, typical wedge shape, with a well balanced udder, while the other milking points are very pronounced. Since arriving at Yanco she has filled out remarkably. Her record so far is :—

1st calf—4,972 lb. milk, 4·0 per cent. test, 231·58 lb. butter in 272 days.
2nd calf—7,914 ,, 4·1 ,, 368·97 ,, 273 ,,

Ornament of Glen Innes, a full sister to Picture, is a red and white cow She is rather a low-set, sturdy, good-constitutioned animal, of a fairly good wedge shape; although the udder is not of the best type, the teats are large and brown in colour. Her record is :—

1st calf—6,432 lb. milk, 4·47 per cent. test, 326·34 lb. butter in 273 days.
2nd calf—4,809 lb. ,, 239·10 lb. butter in 153 days (still milking).

It may be mentioned here that Ornament II of Yanco, out of Ornament of Glen Innes, by Wyllieland Bright Lad (imp.), and another very promising heifer out of Picture by Black Chief, are milking excellently, showing to a marked degree the inheritance of the milk-producing qualities of their grand dam Lady Dado.

These results show what a valuable cow Lady Dado has been to the Department's herds. Incidentally it may be mentioned that for the main part all of the above records have been made off natural pasturage with irregular feeding of lucerne hay, lucerne pasture, and dry area during the summer months.

Mystery—one of the oldest cows in the herd, having been calved in 1908—is by Jamie's Heir, out of Juliette. Her colour is red and white; body of good depth, straight backline, typical wedge shape, udder running well back and forward, teats large and well placed, good temperament. Her records show that she has been a consistent milker. She yielded 7,407 lb. milk, 342·90 lb. butter, in 243 days.

Orphan Girl, calved in 1912, is a red and white cow, by Orphan Boy out of Hattie Craig. She is rather low set and inclined to be short in the body. The udder is nicely placed, extending well back and forward, teats rather close behind, and short. Up to the present her record is :—

1st calf—5,680 lb. milk, 252·4 lb. butter, in 273 days.
2nd calf—7,420 lb. milk, 3·75 per cent. test, 316·4 lb. butter, in 273 days.
3rd calf—4,890 lb. milk, 202·23 lb. butter, in 153 days (still milking).

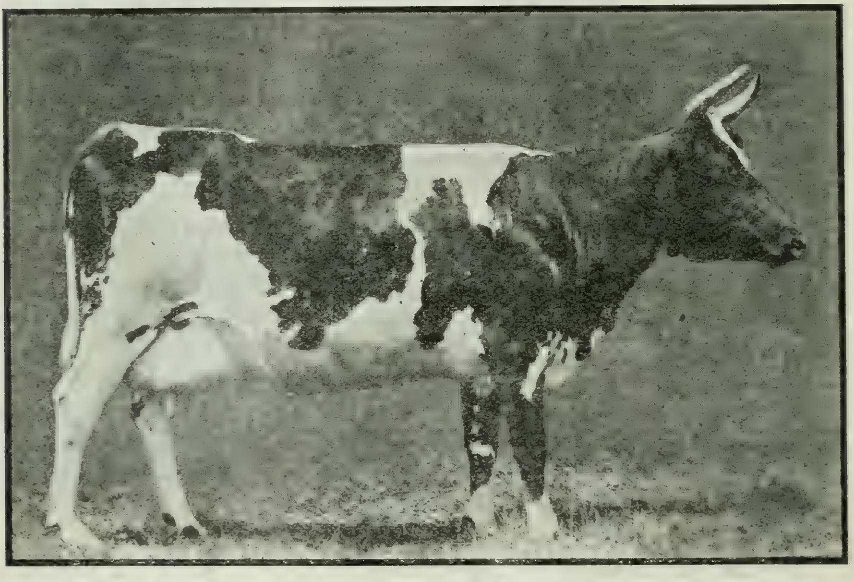
Judy Craig is another red and white cow, rather small, but possessing good constitution. Although not the equal of some of the others from a "score-card" point of view, she is giving very satisfactory yields. Her udder is rather small and the back teats are close, being similar in this respect to her full sister Orphan Girl, for she also has Orphan Boy as her sire and

Hattie Craig as her dam; the latter is by Daniel of Auchenbrain (imp.). She was calved in 1914. Judy Craig's record is as follows :—

As a 2-year-old—5,271 lb. milk, 4·1 per cent. test, and 238·74 lb. butter, in 273 days.

As a 3-year-old—4,644 lb. milk, and 222·9 lb. butter, in 183 days (still milking).

Jane of Coolangatta, although one of the older cows, is one of the best; colour, red and white; barrel large and deep, with well sprung ribs; typical wedge shape; udder well placed and extending well up behind and underneath, and also having plenty of loose skin for expansion; teats large and well placed. Taken all round she is a showy animal. She was calved in 1911, and is by All-u-Want by Jane of Coolangatta. The sire was selected by the present Herdmaster of the Department of Agriculture when he was in Scotland.



Ayrshire Cow, "Mystery of Glen Innes" (3770 A.A.H.B.). By Jamie's Heir, out of Juliette.
Yielded 7,407 lb. milk, 342·9 lb. butter, in 243 days.

Jean of Glen Innes, probably the highest tester in the herd, is by Orphan Boy out of Jane of Coolangatta, and was calved in 1914. She is a brown and white animal and is more profusely coloured than the majority of the cows. Although on the smallish side she is fairly well shaped, and has a nicely placed udder with medium-sized brown teats—a colour much sought after by breeders nowadays. Although possessing a good middle piece and other strong points, she gives one the impression of having a delicate constitution. Her record is :—

1st calf—4,811·5 lb. milk, 4·15 per cent. test, 240·78 lb. butter, in 273 days.

2nd calf—4,812 lb. milk, 262·32 lb. butter, in 183 days.

Moss Rose of Glen Innes (3769) is a whole-coloured red cow, from Violet of Fordwich by Wyllieland Bright Lad (imp. from Scotland), a bull of great constitution; Violet is by Nethercraig Brown Banker, out of White Rose IV (imp.), and gave 5,678 lb. milk, testing 4·3 per cent., and 287 lb. butter, in 262 days. Moss Rose was calved in 1915 and came from Glen Innes while still in milk from her first calf, and although the four days' travelling interfered considerably with her flow of milk, she yielded well.

1st calf—4,564 lb. milk, equal to 205·11 lb. of butter, in 243 days.

2nd calf—4,350 lb. of milk, equal to 211·65 lb. butter, in 283 days (still milking).

She is a medium-sized cow, showing fairly good wedge shape, and possesses a good constitution. Her udder is not of the best, and besides one teat being weak, they are not well placed.

Taken on the average, the herd should be responsible for reproducing some very good records, and the records of young stock by Sportsman of Kabibinokka should be a decided improvement on present yields.

FRUITING OF APPLE TREES EVERY OTHER YEAR.

MANY varieties of apples and pears for various reasons bear only every other year, while the same is true, but to a less extent, of the stone fruits. The causes are somewhat varied, but are considered to be mostly the result of the climatic environment in which the trees are grown. The biennial bearing habit is apparently not an inheritable trait, but when it once becomes fixed in the life of the individual there is little that can be done to change it.

The habit becomes fixed in climates where frosts and rain interfere with the set of fruit, and where the young trees are not properly pruned and the fruit thinned.

An interesting illustration of this perennial bearing habit is quoted by B. S. Brown in the *Journal of Heredity*. One half of the tree had been grafted to a Gravenstein, while the other half was of the original variety of a Russian type. For some unaccountable reason each half of the tree chose opposite years for its heavy crop. In the spring it presents an odd appearance by one half being in heavy bloom while the other half scarcely develops a single blossom. The next year the process is reversed.

The tree is about twenty-five years old, and has behaved as described for the past five years. No certain explanation as to the original cause can be given. As there is some slight difference in the blooming time of the two halves, it is possible that frost may have come at such a time as to destroy the fruit on one side while the other escaped.

It is interesting for two reasons. First, that it indicates that the formation of fruit buds is not wholly a question of nutrition. Second, that the food supply of the tree is directed first to the needs of the maturing crop.

Enzoötic Pneumonia of Calves.

SYDNEY DODD, D.V.Sc., F.R.C.V.S., Veterinary Pathological Laboratory,
The University of Sydney.

PNEUMONIA in young calves in the dairying districts of New South Wales is by no means a new complaint. Every year a greater or fewer number of these animals contract inflammation of the lungs and some recover. In many instances the young animals are given home remedies of a varying nature and efficacy. Apparently however, few farmers have been sufficiently interested to inquire what was the actual cause of the pneumonia affecting their young calves, whether the disease could be prevented and, if so, why not prevented? To the farmer and the majority of laymen, pneumonia means only one thing, but to the trained—as distinguished from the self-styled—veterinarian, it may mean any one or more of several things, each of them capable of, and often producing those serious changes in the lungs which collectively go under the name of pneumonia. Sometimes the inflammation of the lungs may only be a sequel to infection establishing a foothold elsewhere in the body and subsequently involving the lungs. At other times the lungs may be the primary seat of the disease. It follows, therefore, that before pneumonia of an infectious nature, as distinct from the pneumonia which may arise in the individual apart from infection from a pre-existing case, can be satisfactorily treated on modern scientific lines, the special cause must first be ascertained. Without knowing the cause, it is evident that any condition can only be treated by dealing with the symptoms, *i.e.*, the effects and not the cause of the trouble. It is admitted that inflammation of the lungs, like many other conditions, has been treated from time immemorial without the specific causes being known, and in many cases without any thought as to the real cause having arisen. But no one will deny that the average mortality among the domesticated animals contracting infectious pneumonia and its complications and consequences has always been high; and if science can, by demonstrating the cause of any particular outbreak, show how a direct attack upon the disease may be made and so prevent the loss often resulting on account of the special activities of the causal agent, the farmer should make use of such knowledge in his combat against infection in his live stock. Unfortunately, although most of the causes of pneumonia in animals are known, up to the present methods for coping with or preventing an attack of some of the particular causes are not very successful, and consequently in such cases one has to rely upon general principles in treating them. On the other hand, the application of the results of research work to prevention and treatment of some of the pneumonias has in several instances shown pronounced success.

So far as the writer is aware, no pathological and bacteriological investigations into the differentiation of the several causes of the pneumonias in young bovines in this State have hitherto been carried out. (This, be it understood, does not refer merely to the diagnosis and medical treatment of pneumonia as a single entity.)

At present, owing to the shortage of live stock and the high values of young calves, dairy farmers and others are realising that it is no longer a matter of small moment to lose a number of their young stock, and some are realising that the timely aid of science may result in their bank balances being considerably augmented at the end of the year.

The writer has recently been afforded the opportunity of carrying out researches into some of the causes of pneumonia in young calves and means of prevention on a fairly considerable scale on the South Coast (Illawarra district) and in the Hunter River district. The majority of the animals had been born in the neighbourhood of the place where the investigations were conducted, but some had been purchased in the open market at the Homebush saleyards.

In the late spring of 1918 the writer was invited to make the investigations referred to above and, if possible, devise preventive measures. The mortality had already been serious, and the usual treatment as applied to ordinary cases of pneumonia had not succeeded in checking the death-rate. It will save time to mention here that research definitely proved what observation of the symptoms and the course of the malady had suggested, viz., that the pneumonias in the two separate establishments, nearly 200 miles apart, where the investigations were being conducted, were entirely different entities, both being infectious but due to quite different species of bacteria. It is in connection with the particular type of pneumonia found in the cases examined in the Illawarra district that the present article is concerned. The special form found occurring in the Hunter River establishment will be dealt with in a subsequent article.

In order to avoid any controversy, the writer does not suggest that the two particular causes of pneumonia in young calves mentioned are confined to the areas indicated. As a matter of fact, he is convinced that, with more extended bacteriological and pathological research, the two diseases of which pneumonia is a symptom, will be found indifferently not only in both the districts mentioned, but in other dairying centres along the coast. Furthermore, it is not contended that the pneumonia discussed here is a new disease to the State; on the contrary, as has been previously mentioned, it has been present for years, but its true identity was not known. It is, however, suggested that this particular pneumonia has not hitherto in New South Wales (if not other States) been differentiated from the other forms of inflammation of the lungs, both infectious and sporadic, to which young calves are liable.

Enzoötic pneumonia of young calves or, as it is sometimes known, septic pleuro-pneumonia of calves, is due to a specific organism, viz., the *bacillus vitulisepticus.* The bacterium in question belongs to a large group of bacteria known as the Hæmorrhagic septicæmia group, that is to say, the appearance under the microscope and in cultures of the various organisms included in this group are the same, but their effects upon different animals, both when naturally and artificially inoculated, are not always identical. The disease is known in various parts of the world, and some authorities consider it to be actually Hæmorrhagic septicæmia itself. Clinical evidence, however, does not altogether appear to support this contention, at least in this country and some others, and until further evidence of a scientific nature is obtained, it would perhaps be as well to look upon the condition under description as a disease of calves; although one can admit that all the organisms of the Hæmorrhagic septicæmia group may have descended from a common ancestor, but that in the course of time they have adapted themselves to different animals and birds and now under natural circumstances, usually only cause disease in those particular species, and at times at a certain period of life of the latter.

Symptoms.

Two types of this disease may be met with, viz., acute and chronic. The former is usually seen in calves only a few weeks old; very seldom in calves two months or more of age. The onset of the acute form is sudden, the period elapsing between the time of infection and the appearance of symptoms being short. The young animal usually becomes quieter than usual and its appetite is lessened. There is generally a pronounced increase of body temperature (up to 106 or 107 deg. Fahr.). Breathing becomes hurried and laboured. The animal stretches its forelegs and head out, and the nostrils are dilated. A more or less severe cough is often observed and it is frequently accompanied by evident pain. Occasionally however, a cough is not a pronounced feature in an affected calf; frothing at the mouth is often seen, and at times there is a thick sticky discharge from the nostrils. Weakness increases very rapidly, and finally the animal is unable to stand up. Not uncommonly a profuse diarrhœa or even dysentery accompanies the pneumonic condition.

In an acute attack, death usually takes place between the second and sixth day of the disease. It often occurs quite suddenly, but at times the animal lies in a state of semi-consciousness for a few hours before death. If the young animal remains alive, which is not very often, then chronic symptoms of the disease replace those of the acute form.

The chronic form of this complaint may be seen in young calves which have survived an acute attack, or it may arise independently of the acute form when the virulence of the organism has become lessened. It is the common type seen in older calves. In this form, the symptoms are by no means so distressing, nor is the onset so sudden; the course of the disease is more prolonged, and the mortality not so great as in the acute type. The first thing usually noticed by the owner is that the calf has a cough; this becomes more evident as the disease progresses. The breathing becomes more difficult and hurried. An increase in the body temperature may be revealed by the thermometer, but it is not so high as in the acute attacks. The appetite may be impaired and the animal not so lively as a healthy calf, but this is not invariably the case. If recovery does not take place, the animal gradually loses condition, and may die in from four to eight weeks. If the chronic attack has been mild, recovery slowly sets in, but it may take several months before all symptoms have entirely disappeared. Even after recovery from the disease itself the effects of it often remain, the animal being stunted in growth.

From the clinical symptoms (*i.e.*, those shown whilst the animal is alive) there is little or nothing to enable the farmer to distinguish between the pneumonia, &c., produced by the organism responsible for this particular disease and the broncho-pneumonias produced by other organisms, and it may be confounded with a number of diseases of young calves. The only sure means of differentiating these conditions is by bacteriological and pathological examination.

Post-mortem Appearances.

On removal of the skin, small hæmorrhages are occasionally seen in the subcutaneous tissues. The lymphatic glands are distinctly congested. At times there may be one or several large subcutaneous or intermuscular hæmorrhages (this should not be mistaken for a blackleg lesion). The lungs show consolidation in various stages, the parts affected being mainly the apical and cardiac lobes. Occasionally however, the condition has progressed so much that almost the whole of one lung and part of the other may be involved. On one or two occasions a dry pleurisy has been met with also, but this was not usual in the investigations referred to. There is an excess of fluid in the pericardium, usually clear, but at times blood-stained. In very acute cases small hæmorrhages may be seen around the base of the heart. The mucous membrane of the fourth stomach and the intestines are often deeply congested, and may be spotted over with small hæmorrhages. On a number of occasions small shallow ulcerations have been seen on the mucous membrane of the bowels. The liver and kidneys are congested; the latter at times show small hæmorrhages under the capsule, but there is no swelling of the spleen.

The causal organism may be found in the lungs, and in acute cases they can frequently be isolated from the heart blood and various organs (liver, kidneys, spleen, &c.) in a state of purity.

Prevention.

The prospect of recovery for young animals attacked with the acute form of the disease is not very promising, but the number of animals attacked and the death-rate varies considerably according to the age of the calves and the hygienic conditions under which they are kept. Occasionally however, the best of conditions do not appear to check the rapid course of the disease among the young calves exposed to infection. The majority of animals affected during the first few weeks of existence succumb, especially if the pneumonia is accompanied by intestinal complications. As already noted, even those recovering often become stunted in their growth. Medicinal treatment is of little value, and frequently the unskilful administration of drugs by the mouth makes the animal's condition worse. A measure which is often attended with good results is to keep the young calves in the open air and not permit them to become crowded together in small dirty yards or stuffy sheds. By this means bad cases will frequently recover. Brush shelters, open on three sides, should be provided as a protection against the sun or rain.

As in most infectious diseases, preventive measures are the most likely to be attended with success; the measures in this case are mainly concerned with improving the hygienic conditions under which the young calves have to exist, and with vaccination. To prevent the disease being brought from an infected to a non-infected farm, the obvious thing of course is not to purchase calves from a place on which the disease is known to exist. This, however, it is not always possible to carry out, especially when the animals are purchased in the open market. In the latter case, young calves newly purchased should be isolated for about two weeks from those on the farm, and then only allowed to mix with the latter if in the meantime they have not shown any suspicious circumstances. Even with such precautions it may not be possible to exclude infection absolutely, as some calves may act as carriers; that is to say, they may carry the causal organism in their bodies without apparently suffering any ill effects themselves, but they act as centres of infection to susceptible animals.

A feature of this disease, and one which should be borne in mind by farmers, is that once it has occurred on a farm there is a tendency for it to recur every year. In cases where the disease has occurred, weaning the young calves should be delayed, and if the calves are being artificially fed, their constitutions must be maintained by generous, but not excessive, feeding. Healthy calves should be separated from sick or suspicious cases. If possible the healthy animals should be moved to paddocks or yards some distance from the affected animals. It is very obvious, although even this simple precaution needs to be mentioned, that sick and healthy calves should not be allowed to drink or feed out of the same troughs or buckets. With recovered animals, it is always dangerous to permit them to run with the very young, unaffected calves until the latter have reached the age in which the disease is not usually contracted, as the recovered animal may be a potent source in spreading infection. If, however, the healthy ones have been vaccinated, the risk from mixing recovered and healthy calves is very considerably diminished if not abolished altogether.

It is always necessary to disinfect buildings and yards when an infectious disease has occurred in them, but my experience of disinfection on farms is that the process as carried out is hardly likely to shorten the life of the greater number of pathogenic organisms that exist there.

Fortunately the causal organism of this particular disease is not very resistant to adverse conditions, although it is able to live for a considerable time under favourable circumstances outside the animal body, *e.g.*, in wet, swampy lands, badly-drained yards, manure heaps. Dark, dirty corners are also spots favourable to the prolongation of the life and multiplication of the organism. Direct exposure to sunlight, of which we have abundance in this State, is nature's most powerful germicide, and the specific bacteria are soon killed off when placed under such conditions in conjunction with dryness. Under moist conditions, and where its rays cannot act direct, the sun's efficacy as a germ killer is very considerably diminished. The organism which is the cause of this particular form of calf pneumonia is one which, under circumstances favourable to itself, however, is able to live and multiply in the soil. Consequently one must expect occasionally to come across cases of the disease caused by it, apparently arising independently of any preceding case.

Protective Inoculation.

In this as in all other infectious diseases, the aim should be prevention rather than cure, and it must be understood that any good results from vaccination in this particular disease should be looked for in the direction of preventing infection rather than curing individual cases. The farmer will perhaps understand this more readily when he considers that in the latter case, it is not merely a matter of killing the invading organisms, but also of dealing with the damage already created by the latter after they have gained a secure foothold within the body.

It must be admitted that vaccination against enzoötic calf pneumonia is of secondary importance as compared with the prevention of infection by hygienic measures. But sometimes, even the best of food, attention and cleanliness has failed to prevent its spread among young calves once the disease has appeared.

In the case of the outbreak recently investigated by the writer, the hygienic conditions were certainly above those of the ordinary dairy farm. A feature however, was that all the calves were hand-fed. Other treatment having failed, inoculation of a vaccine prepared from the causal organism isolated from affected calves was undertaken. The benefit derived from the use of this vaccine in suitable doses was very apparent, as the loss prior to vaccination was heavy, whereas out of 200 calves inoculated, only one subsequently died of pneumonia due to the organism in question.

Under ordinary conditions, when this disease has broken out on a farm or when there is great risk of its introduction, vaccination is to be recommended, as it appears to afford the greatest safeguard against the further spread of this deadly complaint among the young calves on the premises. It should be clearly understood, however, that the action of this vaccine is like all other vaccines, specific, *i.e.*, it will protect against the disease caused by the same organism from which the vaccine is made and no other. Consequently, before employing this or any other vaccine, it is essential, in order to prevent disappointment, to make sure from bacteriological examination, what is the true cause of the particular disease against which the farmer wishes to have his calves vaccinated. Furthermore, it has been found by experience in other parts of the world, that whilst a vaccine can be prepared from the special organisms isolated from cases occurring in any particular part of the country, such a vaccine appears to be less potent in protecting against the disease than does a vaccine prepared from bacteria isolated from cases occurring in the district in which the vaccine is intended to be used. It follows, therefore, that in order to obtain the fullest protection by the use of such a vaccine, it should be prepared from organisms obtained from cases in the district (though not necessarily the same farm) in which it is going to be employed. An immune serum made by inoculating a horse with successively increasing amounts of cultures of the organism obtained from various districts might be employed both as a preventive and as a curative. This has however, not yet been attempted in this country. And such an immune serum obtained from other countries is, just as vaccine from such countries, not likely to be so beneficial for reasons already given.

The vaccine as employed is made from the dead bodies of the causal organisms, and is therefore quite unable to set up the disease in animals.

RAPE UNDER IRRIGATION.

A MUNGINDI correspondent asks the following questions :—

> Does rape lend itself to irrigation?
>
> Would it matter if the ground were slightly "melon-holey"?
>
> If a good growth were obtained and fed off, would rape make further growth after watering?
>
> What number of sheep per acre would a good growth fatten, and in what time?
>
> What would be the best method to adopt in sowing and irrigating?

In reply the Chief Inspector of Agriculture stated that rape does very well under irrigation, particularly on heavy soil.

It should be sown in rows 2½ feet apart at the rate of about 5 lb. per acre. If there are no means of sowing in drills, it may be broadcasted at the rate of 10 lb. per acre. No attempt should be made at covering, as the seed must be kept near the surface.

Before sowing, furrows about 3 inches deep should be made about 5 feet apart across the field to carry the water when irrigating. This will allow the method of irrigation mentioned in the March *Gazette* (when dealing with lucerne) to be followed on black soils, but on light loamy soils the irrigation should take place before sowing.

When the water is flowing along the furrows, it can be held up occasionally (by throwing in a little earth) so that the land will be thoroughly soaked. The water must not be allowed to flow over the surface of the land, as it leads to caking, and the young plants will be prevented from breaking through.

The surface must be fairly level, and "melon-holes" are objectionable. To get the best results the land always requires levelling before irrigation.

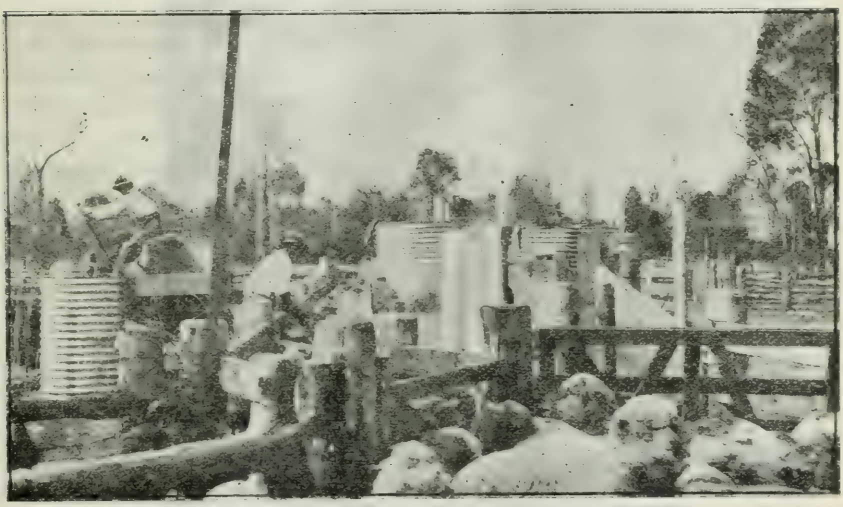
About twenty-five to thirty sheep per acre can be carried on a good crop of rape within three or four months of sowing, and fattening that number in about six or eight weeks. A good second growth is often obtained.

The Prevention of Blow-fly Attacks on Sheep by Spraying.

A. H. E. McDONALD, Chief Inspector of Agriculture.

IN addition to work which is being done by the Sheep-fly Experiment Station, experiments have been conducted during the past three years at Trangie Experiment Farm, the object of which was to ascertain whether spraying of the parts subjected to the attacks of the fly would prove an efficient means of combating the pest.

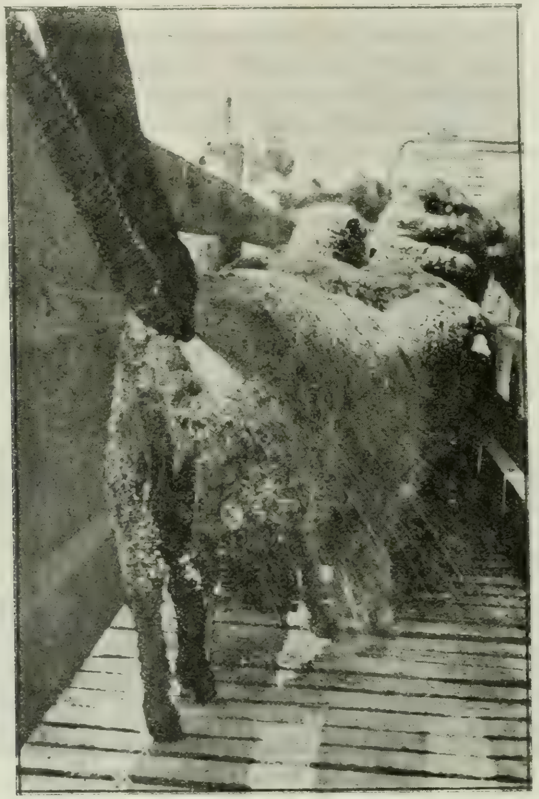
A spraying race has been provided for the work, and the spraying is done by means of a powerful hand-pump. Indeed, though referred to as "spraying" the operation really consists of forcing the liquid into the wool by means of a very strong jet. The specifics under test were an arsenical sheep-dip powder, a carbolic liquid dip, and a mixture the active agent in which was arsenite of soda. These specifics were mixed with water to make a solution strong enough to destroy maggots without injuring the sheep or the wool.



Sheep being Sprayed in the Race.

For the purpose of the experiment, four groups of sheep were made, and during the course of the season each group was treated with the specific allotted to it, while one untreated group was kept under similar conditions to serve as a check. No crutching was done, as it was considered that the wool was required to hold the specific. The poisonous ingredients were retained in the wool, and it was considered that when the young maggots hatched out after the eggs had been deposited by the flies, they would be poisoned. As, however, the natural growth of the wool results in a clean growth near the skin after a time, the application was repeated after six weeks.

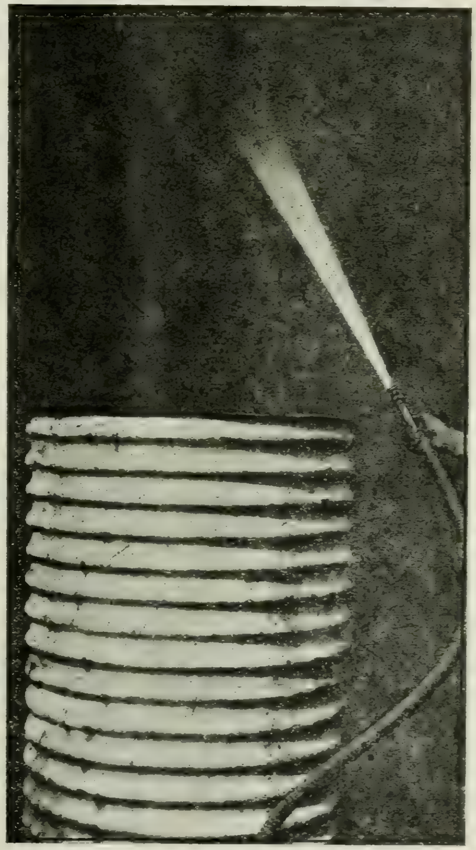
During the first season definite results in prevention of the attacks were not obtained, the experiments being in the initial stages, but the information secured provided a sound basis for further work. During last year, and also during the season just past, the blow-fly was comparatively inactive, and consequently no definite data was obtained. It was observed during last year that the treated sheep were not absolutely protected from attacks by the sprays; but while the affected sheep in the untreated group amounted to 54 per cent, in each of the treated groups the percentage of affected sheep was only 33 per cent., a fairly substantial reduction. In arriving at the number of affected sheep, all that were struck, even although only in a very minor way, were counted.



Spraying around the Crutch.

Note the strength of the jet, which must be sufficient to force the liquid into the wool.

So far the experiments have been conducted with valuable stud sheep, and consequently when sheep were found to be struck they were at once treated. During next season it is proposed to use less valuable sheep in the experiments, and to allow a period of time to elapse after attack by the fly to determine whether the maggots will spread to any extent in the presence of the specifics. So far the experiments have indicated that the attack is localised by the treatment. If this is confirmed by future results, these experiments will be very valuable as indicating a method of preventing losses; for when sheep are untreated and the conditions are favourable to the activities of the fly, the maggots spread so rapidly over the sheep that death takes place before treatment can be carried out.



The Style of Jet used.

Although the term "spraying" is generally employed, in reality it is a very strong jet that is produced, rather than a spray.

The accompanying photographs convey a general idea of the manner in which the work is done. An inexpensive pump was used which happened to be attached to a fire-fighter, and which gives a pressure of about 60 lb., while the nozzle of the jet is about $\frac{1}{8}$ inch in diameter. A man is required to work the pump; but if large numbers of sheep are to be treated, the pump could be driven by power. The work can be done by two men, although an extra man makes it much easier. A large number of sheep (up to 1,000) can be put through in a day; and as the material used is cheap, the cost of treating each sheep amounts to only about 1½d. each spraying.

Sheep and Wool for Farmers.

CROSS-BREEDING EXPERIMENTS.

WOOL YIELD AND VALUE.

[Continued from page 175.]

J. WRENFORD MATHEWS.

Bathurst Experiment Farm and Combined Results.

So far we have reviewed these results from the standpoints of body and fleece weights. We have traced in three recent articles the development through the various periods, from the time the lamb was 5 months old until the sheep, in the case of the wethers, reached the age of 5 years 5 months, and in the case of the ewes, 8 years 5 months.

However convincing the results may have appeared to be up to that point, without the wool yields and values the report would be quite incomplete. The previous reports showed that right through the Lincoln cross had an advantage over the other two in respect of weight of fleece, and that it maintained a superiority over the Leicester cross both in body and fleece, but that the Border Leicester cross evinced a material gain over both on the score of body weight. We have now to see whether the Lincoln cross with its extra weight of fleece gives a greater monetary return than the Border Leicester, and whether the Leicester cross can claim any special advantage in wool to make up for its deficiency compared with the other two in weight of wool and carcase.

The task of computing these wool returns has proved most intricate. Wool is a product that exhibits many technical differences that cannot be easily explained here, but it has nevertheless proved impossible at times to avoid lengthy explanations, for which the apology must be the importance of the subject, and the fact that the figures record much careful research work.

Clean Wool Yield and Value.

What is meant by wool yield and value, is the clean yield return minus the grease and all matter that is foreign to the wool in the process of manufacture, and the nett value based on market rates. The latter is usually regulated by values which vary from time to time, in accordance with market fluctations, for grades or classes commonly known as "tops"—a term which merely signifies the first definite stage in manufacture, and at which values are usually calculated.

Wide divergencies in character, style, texture, and quality exist between the different longwool breeds and Merinos, and it has been necessary to adopt methods of conducting the trials and recording the results that will enable comparative values to be accurately ascertained.

In the first place I propose to review the results from their three more important aspects:—(1) The variations in quality between the wool of the different breeds; (2) the clean yield of the wool of different grades; and (3) the value of the wool as based on market rates. The differences must be traced through the progeny of the three breeds, not only independently, but also collectively, if a decision is to be arrived at concerning the most suitable breed for mating with the Merino.

In order that values might be accurately arrived at—the lots being too small to be offered separately with any advantage to the experiments—it was decided to classify the fleeces on the different farms at the time of shearing in each year, the various ages being kept separate, and all particulars duly recorded. To enable the tests to be carried to a final conclusion, careful classification was made, and then samples from every fleece, and representative of each individual lot, were taken to enable the clean scoured yield to be ascertained. The fleeces were uniformly skirted, all low breach and fribby portions being removed; so that the samples consisted of only body wool in the major portion of the fleece, but still sufficient to enable reliable data for all purposes to be collected.

The testing of the samples in itself has been no small undertaking. It was done by a series of laboratory tests; as many as three, and even four, tests being made of the various qualities of the different crosses at the various ages. In instances where the tests have shown irregularities as compared with others of the same lots, and for similar grades of wool, additional tests have been made. Each lot in the respective groups and crosses has been worked out, first separately and then conjointly, before a common average of wool yield for each grade and each cross at the three farms has been arrived at. The work has involved a great deal of detail, both in the conduct of the test and in the computation of the returns; and officers who have co-operated in the work may well feel a sense of satisfaction in the information obtained and in the consistency of the results.

The Variability of the Crosses.

The great variation in the wool from crossbred sheep is one of the drawbacks to the successful establishment and perpetuation of any crossbred strain, and in the absence of any breed known to be better adapted to our requirements crossing is likely to continue, notwithstanding the mixed character of the wool so produced. That being the case, there is nothing to do but to proceed on the soundest practical lines, and it is to that end that these experiments are directed. An unduly mixed class of wool is at all times undesirable, for not only does it entail more extensive classification in the division of the clip; but if the flock be limited in number there is seldom enough of any particular class to enable the clip to be represented by anything but small lots, a condition that always operates against the best prices being obtained. The extent, therefore, to which variation appears in the wool is a factor not to be ignored in reviewing the results of these trials.

Before commenting on the merits of the strains in this particular, a table is inserted which sets out the results obtained at Bathurst Experiment Farm, distinguishing between the different crosses, and recording the number of fleeces in each separate year's shearing, the various counts, the percentage yield of clean wool, and the values of the "tops" and of the greasy wool. Upon the particulars contained in this table are based all the subsequent calculations and deductions.

TABLE showing Classification, Clean Yield, "Top" and Greasy Values of Wool produced by the Different Crosses at Bathurst Experiment Farm.

Sex.	Lincoln-Merino.					Leicester-Merino.					Border Leicester-Merino.				
	No. of Fleeces.	Count or Quality of Wool.	Clean Yield. Per cent.	Values.		No. of Fleeces.	Count or Quality of Wool.	Clean Yield. Per cent.	Values.		No. of Fleeces.	Count or Quality of Wool.	Clean Yield. Per cent.	Values.	
				Top.	Greasy.				Top.	Greasy.				Top.	Greasy.
		's		d. per lb.	d. per lb.		's		d. per lb.	d. per lb.		's		d. per lb.	d. per lb.
	1 year 4 months.					Year 1912.									
Wethers and Ewes.	2	56	48·	24½	8¾	8	56	40·	24½	8¾	8	56	59·	24½	11¼
	11	50	55·	21½	9¼	9	50	50·	21½	8¼	10	50	61·	21½	10½
	4	46	57·	18½	7¾	...	...	...	...	...	3	46	64·	18½	8¾
	1 year 4 months.					Year 1913.									
Wethers ...	...	...	...	...	...	4	56	56·25	23	9¼	4	56	60·	23	10¾
,, ...	3	50	60·	21	9¾	2	50	59·	21	9½	2	50	63·	21	10¼
,, ...	3	46	62·	17	8¼	...	...	...	...	...	...	...	...	...	...
Ewes ...	5	56	55·9	23	9½	4	56	59·	23	10½	5	56	60·	23	10¾
,, ...	3	50	64·71	21	10¾	4	50	64·25	21	10½	4	50	63·	21	10¼
,, ...	2	46	62·	17	8¼	...	...	...	...	...	3	46	66·	17	8¾
	2 years 4 months.														
Wethers ...	...	...	...	...	...	3	56	56·25	23	9¾	1	56	60·	23	10¾
,, ...	...	...	...	...	...	1	50	59·	21	9½	2	50	63·	21	10¼
,, ...	2	46	62·	17	8¼	...	...	...	...	...	...	...	...	...	...
Ewes ...	1	56	58·	23	10¼	8	56	56·25	23	9¾	10	56	60·	23	10¾
,, ...	3	50	64·71	21	10¾	2	50	59·	21	9½	4	50	63·	21	10¼
,, ...	5	46	62·	17	8¼	...	...	...	...	...	3	46	66·	17	8¾
	1 year 4 months.					Year 1914.									
Wethers ...	...	...	...	...	...	1	56	58·41	27½	11¼	2	56	64·23	27½	13
,, ...	1	54	59·37	27	11½	4	54	57·27	27	11¼	2	54	64·	27	12¾
,, ...	3	50	61·	26	11¾	1	50	61·72	26	11¾	...	...	...	...	...
,, ...	2	46	68·13	22	10¾	...	...	...	...	...	...	...	...	...	...
Ewes ...	...	...	...	...	...	1	58	53·43	28	10¾	1	58	54·39	28	11
,, ...	2	56	62·	27½	12¾	3	56	53·83	27½	10½	4	56	60·93	27½	12¼
,, ...	2	54	62·15	27	12½	...	...	...	...	...	3	54	62·64	27	12¾
,, ...	4	50	66·79	26	13	11	50	59·54	26	11¾	5	50	65·30	26	12¾
,, ...	14	46	69·53	22	11½	4	46	60·37	22	9¼	4	46	67·18	22	10½
,, ...	3	44	70·62	21	11	...	...	...	...	...	...	...	...	...	...

TABLE showing Classification, Clean Yield, "Top," and Greasy Values—*continued.*

Sex.	Lincoln-Merino.					Leicester-Merino.					Border Leicester-Merino.				
	No. of Fleeces.	Count or Quality of Wool.	Clean Yield. Per cent.	Values.		No. of Fleeces.	Count or Quality of Wool.	Clean Yield. Per cent.	Values.		No. of Fleeces.	Count or Quality of Wool.	Clean Yield. Per cent.	Values.	
				Top.	Greasy.				Top.	Greasy.				Top.	Greasy.
		's		d. per lb.	d. per lb.		's		d. per lb.	d. per lb.		's		d. per lb.	d. per lb.
	2 years 4 months.					Year 1914.									
Wethers ...	3	56	57·81	27½	11½	...	...	...	...	...	3	56	61·71	27½	12½
,, ...	...	...	...	...	.	2	54	59·76	27	12	...	...	...	...	...
,, ...	...	...	...	...	...	4	50	61·9	26	12½	2	50	69·37	26	13½
,, ...	3	46	61·80	22	9½	...	...	...	...	...	...	...	...	...	...
Ewes ...	...	...	...	...	...	2	58	51·38	28	10¼	1	58	56·25	28	11¼
,, ...	3	56	59·18	27½	12	2	56	59·37	27½	12	4	56	61·	27½	12½
,, ...	...	...	...	...	...	...	...	...	...	...	4	54	62·64	27	12¼
,, ...	4	50	66·19	26	13	4	50	65·23	26	12¾	3	50	70·	26	13¾
,, ...	2	46	69·53	22	11½	...	...	...	...	...	...	...	...	...	...
	3 years 4 months.														
Wethers ...	...	...	...	...	...	3	56	58·33	27½	11¾	3	56	59·5	27½	12
,, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
,, ...	1	50	62·98	26	12¼	...	...	...	...	...	...	...	...	...	...
,, ...	1	46	72·07	22	11½	...	...	...	...	...	...	...	...	...	...
Ewes ...	...	...	...	...	...	...	...	...	...	...	2	58	51·3	28	10¼
,, ...	3	56	60·30	27½	12¼	4	56	62·50	27½	12¾	6	56	58·93	27½	11¾
,, ...	...	...	...	...	...	5	54	61·31	27	12¼	4	54	60·49	27	12
,, ...	4	50	64·58	26	12½	...	...	...	...	...	4	50	63·49	26	12
,, ...	2	46	64·84	22	10¼	...	...	...	...	...	1	46	70·46	22	11
	1 year 4 months.					Year 1915.									
Wethers ...	...	...	...	...	...	...	...	...	...	...	6	58	61·5	38	19¼
,, ...	2	56	59·62	35	17¼	2	56	63·	35	18½	5	56	61·	35	17½
,, ...	2	54	61·	34	17¼	...	...	...	...	...	...	...	...	...	...
,, ...	5	50	64·	33	17½	9	50	66·	33	18¼	2	50	67·	33	18½
,, ...	7	46	64·25	28	15	1	46	67·	28	15¾	...	...	...	...	...
,, ...	3	44	66·	26	13½	...	...	...	...	...	...	...	...	...	...
Ewes ...	...	...	...	...	...	...	...	...	...	...	6	56	61· 3	35	17½
,, ...	3	54	65·	34	18½	8	54	61·	34	17¼	...	...	...	...	...
,, ...	4	50	65·	33	17¾	13	50	66·	33	18¼	10	50	63·2	33	17½
,, ...	7	46	64·7	28	15	...	...	...	...	...	2	46	65·5	28	15½
,, ...	3	44	68·	26	13¼	...	...	...	...	...	...	...	...	...	...
	2 years 4 months.														
Wethers ...	...	...	...	...	...	2	56	60·5	35	18	2	56	61·	35	17½
,, ...	...	...	...	...	...	3	54	62·	34	17½	...	...	...	...	...
,, ...	...	...	...	...	...	1	50	66·	33	18¼	2	50	64·5	33	17¾
,, ...	4	46	62·	28	14½	...	...	...	...	...	...	...	...	...	...
,, ...	1	44	64·6	26	13¾	...	...	...	...	...	...	...	...	...	...
Ewes ...	...	...	...	...	...	2	58	52·	38	16	2	58	55·	38	17½
,, ...	2	56	60·	35	17¼	3	56	60·	35	17¼	1	56	63·	35	18½
,, ...	2	54	64·	34	18	9	54	60·	34	17	5	54	65·	34	18½
,, ...	6	50	64·5	33	17½	5	50	64·	33	17½	5	50	66·	33	18
,, ...	12	46	66·	28	15½	...	...	...	...	...	1	46	71·	28	16¼
,, ...	3	44	73·	26	13½	...	...	...	...	...	...	...	...	...	...
	3 years 4 months.														
Wethers ...	...	...	...	...	...	...	...	...	...	...	3	58	61·	38	19¼
,, ...	...	...	...	...	...	2	56	61·37	35	17½	...	...	...	...	...
,, ...	...	...	...	...	...	...	...	...	...	...	2	54	65·	34	18½
,, ...	3	50	63·	33	17¼	3	50	66·	33	18¼	...	...	...	...	...
,, ...	3	46	64·	28	15	...	...	...	...	...	...	...	...	...	...
Ewes ...	...	...	...	...	...	2	58	54·	38	17	4	58	62·	38	19¾
,, ...	3	56	50·	35	13¾	2	56	63·	35	18½	3	56	62·	35	18
,, ...	...	...	...	...	...	2	54	61·	34	17¼	...	...	...	...	...
,, ...	3	50	60·	33	16	2	50	65·	33	17¾	3	50	69·	33	20
,, ...	3	46	67·	28	15¾	...	...	...	...	...	...	...	...	...	...
	4 years 4 months.														
Wethers ...	...	...	...	...	...	...	...	...	...	...	2	58	60·8	38	19¼
,, ...	...	...	...	...	...	3	56	64·5	35	19¾	1	56	63·	35	18½
,, ...	1	50	57·	33	15½	...	...	...	...	...	...	...	...	...	...
,, ...	1	46	67·	28	15¾	...	...	...	...	...	...	...	...	...	...
Ewes ...	...	...	...	...	...	3	58	57·	38	18¾	4	58	61·	38	19¾
,, ...	3	56	57·	35	16	3	56	58·	35	16¾	7	56	62·	35	18
,, ...	...	...	...	...	...	...	...	...	...	...	2	54	67·	34	19
,, ...	4	50	61·	33	16½	1	50	60·	33	16¼	4	50	67·	33	18¼
,, ...	2	46	67·	28	15¾	...	...	...	...	...	...	...	...	...	...

TABLE showing Classification, Clean Yield, Clean Scoured, and Greasy Values.

Sex.	Lincoln-Merino.					Leicester-Merino.					Border Leicester-Merino.				
	No. of Fleeces.	Count or Quality of Wool.	Clean Yield. Per cent.	Values.		No. of Fleeces.	Count or Quality of Wool.	Clean Yield. Per cent.	Values.		No. of Fleeces.	Count or Quality of Wool.	Clean Yield. Per cent.	Values.	
				Clean Scoured.	Greasy.				Clean Scoured.	Greasy.				Clean Scoured.	Greasy.
		's		d. per lb.	d. per lb.		's		d. per lb.	d. per lb.		's		d. per lb.	d. per lb.
						Year 1916.					2, 3, 4, 5 years 4 months.				
Wethers ...	...	...	...	...	...	...	...	...	...	...	10	58	58·75	31	18·22
	2 years 4 months.					2, 3, 4, 5 years, and 5 months.									
,, ...	2	56	61·11	28	17·11	6	56	59·13	28	16·35	8	56	64·6	28	18·08
	2 and 3 years, 4 months.														
,, ...	3	54	63·26	27	17·08	...	...	...	...	...	3	54	66·96	27	18·07
	2, 3, 4, and 5 years, 4 months.														
,, ...	8	50	63·54	25	15·88	17	50	62·92	25	15·73	4	50	67·91	25	16·97
	2, 3, 4, and 5 years, 4 months.														
,, ...	14	46	67·52	22	14·85	...	...	...	...	...	...	...	...	...	...
	2, 3, and 4 years, 4 months.														
,, ...	4	44	72·22	20	14·44	...	...	...	...	...	...	...	...	...	...
						2, 3, 4, and 5 years, 4 months.					2, 3, 4, and 5 years, 4 months.				
Ewes ...	...	...	...	...	...	11	58	57·18	31	17·72	17	58	66·33	31	20·56
	3, 4, and 5 years, 4 months.														
,, ...	8	56	60·	28	16·80	35	56	63·14	28	17·67	21	56	67·90	28	19·02
	2, 4, and 5 years, 4 months.														
,, ...	7	54	63·12	27	17·04	...	...	...	...	...	13	54	66·87	27	18·05
	2, 3, 4, and 5 years, 4 months.														
,, ...	16	50	63·75	25	15·94	9	50	66·71	25	16·67	8	50	66·87	25	16·71
,, ...	20	46	69·6	22	15·3	...	...	...	...	...	...	...	...	...	...
	2, 3, and 4 years, 4 months.														
,, ...	6	44	72·5	20	14·5	...	...	...	...	...	...	...	...	...	...
						Year 1917.					3, 4, 5, and 6 years, 4 months.				
Wethers ...	...	...	...	...	...	...	...	...	...	...	8	58	66·04	31	20·47
	3 years 4 months.					3, 4, and 5 years, 5 months.									
,, ...	1	56	54·37	28	15·22	7	56	60·6	28	16·96	7	56	67·29	28	18·84
	3 and 5 years, 4 months.														
,, ...	4	54	57·5	27	15·5	...	...	...	...	...	3	54	69·68	27	18·81
	3, 4, and 5 years, 4 months.														
,, ...	10	50	68·74	25	17·18	13	50	66·30	25	16·37	4	50	74·76	25	18·69
,, ...	12	46	71·25	22	15·67	...	...	...	...	...	...	...	...	...	...
	3 years 4 months.														
,, ...	3	44	76·55	20	15·31	...	...	...	...	...	...	...	...	...	...
						3, 4, 5, and 6 years, 4 months.					3, 4, 5, and 6 years, 4 months.				
Ewes ...	...	...	...	...	...	12	58	59·	31	18·29	17	58	58·93	31	18·26
	3, 4, 5, and 6 years, 4 months.														
,, ...	10	56	60·31	28	16·88	31	56	61·40	28	17·19	21	56	60·31	28	16·88
	3, 4, and 6 years, 4 months.														
,, ...	7	54	59·55	27	16·07	...	...	...	...	...	15	54	65·	27	17·55
	3, 4, 5, and 6 years, 4 months.														
,, ...	15	50	60·96	25	15·24	9	50	62·6	25	15·65	6	50	71·25	25	17·91
,, ...	17	46	68·74	22	15·12	...	...	...	...	...	...	...	...	...	...
	3 and 4 years, 4 months.														
,, ...	4	44	72·5	20	14·5	...	...	...	...	...	...	...	...	...	...
						Year 1918.					4 and 5 years 4 months.				
Wethers ...	...	...	...	...	...	...	...	...	...	...	3	58	63·28	31	19·61
	4 years 4 months.					4 and 5 years, 4 months.									
,, ...	1	56	53·12	28	14·87	5	56	61·	28	17·08	6	56	69·37	28	19·42
	4 and 5 years, 4 months.														
,, ...	7	50	66·99	25	16·84	12	50	63·4	25	15·85	...	...	...	...	...
,, ...	14	46	71·2	22	15·6	...	...	...	...	...	8	50	67·98	25	16·99
	4 years 4 months.														
,, ...	1	44	74·37	20	14·87	...	...	...	...	...	...	...	...	...	...
						4, 5, 6, and 7 years, 4 months.					4, 5, 6, and 7 years, 4 months.				
Ewes ...	...	...	...	...	...	12	58	57·18	31	17·72	15	58	55·65	31	17·25
	4, 5 6, and 7 years, 4 months.														
,, ...	15	56	54·80	28	15·34	33	56	57·8	28	16·18	18	56	58·3	28	16·32
,, ...	15	50	59·6	25	14·8	6	50	63·43	25	15·85	5	50	62·81	25	15·70
,, ...	...	...	...	...	...	...	...	...	...	...	13	54	60·18	27	16·24
,, ...	17	46	62·9	22	13·8	...	...	...	...	...	...	...	...	...	...
	4 and 5 years, 4 months.							...							
,, ...	4	44	65·93	20	13·8	...	...	...	...	...	...	...	...	...	...

It will be noted that for the years 1912 to 1915, inclusive, distinction has been made between the ages, and the number of fleeces of each grade in the group has been specified. This was done with the object of showing to what extent variation was apparent in the three groups of crosses. For the sake of brevity, and because variations can be more reliably traced in the younger than during the older ages, it was not thought necessary to proceed beyond the year 1915. The youngest of the groups had then reached the age of 2 years 5 months, and we were already in possession of records of sheep at the age of 4 years 5 months.

These particulars have been set out in parallel columns so that the particulars for the various crosses may be compared. Even a cursory glance through the table will show that the variation in grade or quality (as the term is used in its more technical sense) is wider in the Lincoln cross than in either of the other breeds. Extensive variations can be seen in the 46s of the Leicester and Border Leicester crosses, but this count is but a small proportion of the fleeces compared with the higher counts.

In order that the point may be clearly elucidated, I have extracted from the main table the figures which have a bearing on this point, and present them in tabular form. From these we may arrive at some averages, and so deduce in what proportions the different grades are represented :—

Count or Quality.	Lincoln-Merino.		Leicester-Merino.		Border Leicester-Merino.	
	Wethers.	Ewes.	Wethers.	Ewes.	Wethers.	Ewes.
	No.	No.	No.	No.	No.	No.
58s	...	...	...	45	32	63
56s	10	56	41	133	44	112
54s	10	21	9	24	10	59
50s	43	90	65	82	30	68
46s	70	106	1	4	...	17
44s	12	23	...	...	...	...

Beyond showing relative proportions, the wethers are of little significance in this connection, and in any case they represent only the portion held over each year for comparison with the ewes. The figures given for the ewes, however, are sufficiently reliable, as they represent practically the number originally dropped.

The following figures, for ewes only, fairly clearly conveys the proportion of fleeces representative of the various qualities of the three breeds :—

Lincoln cross—56s, 19 per cent.; 54s, 77 per cent.; 50s, 30 per cent.; 46s, 35·81 per cent; 44s. 7·77 per cent., for a total of 296 fleeces.

Leicester cross—58s, 15·62 per cent.; 56s, 46·18 per cent.; 54s, 8·33 per cent.; 50s, 28·47 per cent.; 46s, 1·4 per cent., for a total of 288 fleeces.

Border Leicester cross--58s, 20 per cent.; 56s, 35·11 per cent.; 54s, 18·5 per cent.; 50s, 21·31 per cent.; 46s, 5·32 per cent., for a total of 319 fleeces.

The extreme coarseness of the wool of the Lincoln breed has been handed down in a considerable measure to its progeny, its influence being apparently greater than in the case of the Leicester. It will be noted that while, in the Lincoln group, approximately 36 per cent. of the fleeces are represented in the 46s and 30 per cent. in the 50s, only 1·4 per cent. and 28·47 per cent. respectively for these classes are shown in the case of the Leicester cross, although practically only one standard of count separated the wools of the purebreds of the two breeds. Again, it is rather surprising to observe that the fleeces of the Leicester cross, as a whole, are finer than those of the Border Leicesters, though the latter was itself actually finer in fleece character than the former, *i.e.*, taking as a criterion the proportions represented in the various counts.

The standard quality of fleeces of the Leicester and Border Leicester rams used in the trials was 40s in the former and 44s and 46s in the latter. Still, we find that 46·18 per cent. of the Leicester fleeces are included in the 56s division, and only 35·11 per cent. of the same class in the Border Leicester cross.

For still more convincing proof as to this state of variability in the wool-producing propensities of the breeds, we may take the proportions from the figures for the sheep at Wagga and Cowra Experiment Farms, first singly and then conjointly.

Count.	Lincoln-Merino.		Leicester-Merino.		Border Leicester-Merino.	
	Wethers.	Ewes.	Wethers.	Ewes.	Wethers.	Ewes.
	No. of Fleeces.	No. of Fleeces.	No. of Fleeces.	No. of Fleeces.	No. of Fleeces.	No. of Fleeces.
			Wagga Experiment Farm.			
58s	...	1	11	108	21	129
56s	6	35	39	122	41	192
54s	19	59	21	86	16	124
50s	22	98	22	110	35	139
46s	36	122	16	13	3	29
44s	6	25	...	...	...	...
			Cowra Experiment Farm.			
58s	...	3	10	159	17	97
56s	16	92	34	177	35	110
54s	14	96	20	151	16	86
50s	35	171	24	98	17	92
46s	36	149	...	14	6	16
44s	2	26	...	...	...	1
40s	...	3	...	...	...	...

From the ewes we may again take the qualities represented in the following proportions :—

Wagga Experiment Farm—

Lincoln cross—58s, 29 per cent.; 56s, 10·3 per cent.; 54s, 17·35 per cent.; 50s, 28·32 per cent.; 46s, 35·89 per cent.; 44s, 7·35 per cent.

Leicester cross—58s, 24·60 per cent. ; 56s, 25·51 per cent. ; 54s, 19·59 per cent. ; 50s, 25·29 per cent. ; 46s, 2·95 per cent.

Border Leicester cross—58s, 21·21 per cent.; 56s, 31·51 per cent.; 54s, 20·4 per cent.; 50s. 22·03 per cent.; 46s, 4·75 per cent.

Cowra Experiment Farm—

Lincoln cross—58s, 5 per cent.; 56s, 17·22 per cent.; 54s, 18 per cent. ; 50s, 31·66 per cent.; 46s, 27·59 per cent. ; 44s, 4·81 per cent. ; 40s, ·5 per cent.

Leicester cross—58s, 26·54 per cent.; 56s, 29·54 per cent.; 54s, 25·1 per cent.; 50s, 16·36 per cent.; 46s, 2·33 per cent.

Border Leicester cross—58s, 24·12 per cent.; 56s, 27·36 per cent.; 54s, 21·14 per cent.; 50s, 22·88 per cent.; 46s, 8 per cent.; 44s, ·24 per cent.

The above figures show marked consistency in the relative proportions of the different qualities or counts, and more particularly so when comparisons are made of the proportions at the different farms. Even more convincing is a combination of the results at the three farms, such as is presented in the following table, which shows the combined percentages of the different grades or counts in the three crosses.

COMBINED Percentages of Various Counts at Bathurst, Wagga, and Cowra Experiment Farms.

Count.	Lincoln-Merino.		Leicester-Merino.		Border Leicester-Merino.	
	Ewes.		Ewes.		Ewes.	
	No. of Fleeces.	Percentage.	No. of Fleeces.	Percentage.	No. of Fleeces.	Percentage.
58s	4	·34	312	23·53	289	21·74
56s	183	15·86	432	32·57	414	31·15
54s	176	14·96	261	19·67	269	20·24
50s	359	30·52	290	21·87	294	22·12
46s	377	32·05	31	2·33	62	4·66
44s	74	6·29	...	......	1	·07
40s	3	·25	...	......	...	......

These figures certainly point to the Leicester crosses being productive of a finer class of wool than even those of the Border Leicester. Comparing the returns, quality for quality and cross with cross, one cannot help but be struck with the more equal division of the counts in the case of the Leicester than of either of the other two breeds.

Practically 70 per cent. of the fleeces belonging to the Lincoln cross appear among the coarser grades, while 56 per cent. of the Leicester fleeces are 56s or finer, and practically 53 per cent. of the Border Leicester fleeces are 56s or finer.

The Clean Wool Yield.

This seeming disposition on the part of the Leicester to produce a finer wool in the crosses than the wool of the pure-bred parents would lead one to expect, should also exert a strong influence on the wool of the crossbred strains in another direction. Where the wool inclines to fineness it naturally follows that it contains more grease, and this disposition in turn indicates that the breed or strain is given to producing yolk in combined ratio with wool, but somewhat at the expense of the wool substance. The only means of proving whether this is so is to compare the different grades in respect of their clean yield, and this can be done in the following table, which also brings us to the second point in our investigation, viz., the clean wool yield.

CLEAN Wool Yield from the various grades at Bathurst Experiment Farm.

Count.	Lincoln-Merino.				Leicester-Merino.				Border Leicester-Merino.			
	Wethers.		Ewes.		Wethers.		Ewes.		Wethers.		Ewes.	
	No.	Percentage.	No.	Percentage.	No.	Percentage.	No.	Percentage.	No.	Percentage.	No.	Percentage.
58s ..	..	....	..	....	..	....	45	57·	32	61·85	63	60·
56s ..	10	57·03	56	57·40	41	58·7	133	59·9	44	63·73	112	61·5
54s ..	10	60·11	21	62·18	9	59·4	24	60·68	16	66·69	59	63·81
50s ..	43	64·55	90	61·92	65	63·64	82	62·78	30	67·07	68	65·22
46s ..	70	67·50	106	66·43	1	67·	4	60·37	..	....	17	66·37
44s ..	12	71·25	23	70·58	..	....	..	...	..	....	..	....

Without, at this stage, attempting to use the above table for the comparison of the different crosses from the standpoint of their relative yielding values, we must at least remark the consistency that is revealed as between the yields of the various wools. In almost every instance, the finer the wool the greater the actual loss in pure wool return. Against that, of course, must be set the greater value of the finer wools. With the object of showing how the Leicester cross stands in this respect, the following little table summarises the average percentage of clean yield from all grades in the case of each of the three crosses at Bathurst:—

Cross.	Wethers.		Ewes.	
	No.	Yield.	No.	Yield.
		per cent.		per cent.
L_1M ...	145	65·71	296	63·4
L_2M ...	116	61·51	288	60·22
L_3M ...	116	65·18	319	62·18

On these showings, the Leicester cross wethers average 4·20 per cent. poorer yield than the Lincolns and 3·67 per cent. lower than the Border Leicester, and the Leicester cross ewes 3·18 per cent. and 2·4 per cent. less respectively. Before dwelling on the value of the strains in this respect, however, let us see what the combined averages have got to say. Another extensive table was prepared embodying the particulars at all three farms as has been done in the case of Bathurst, but the following probably presents sufficient information for all practical purposes.

COMBINED Average Percentages of Clean Yields at Wagga Experiment Farm.

Count.	Lincoln-Merino.				Leicester-Merino.				Border Leicester-Merino.			
	Wethers.		Ewes.		Wethers.		Ewes.		Wethers.		Ewes.	
	No.	Yield.	No.	Yield.	No.	Yield.	No.	Yield.	No.	Yield.	No.	Yield.
		per cent.		per cent.		per cent.		per cent.		per cent.		per cent.
58s ..	..	..	1	56·55	11	54·65	108	57·53	21	60·40	129	59·26
56s ..	6	62·21	35	58·76	39	55·35	122	56·12	41	63·67	192	62·01
4s ..	19	62·27	59	63·04	21	59·98	86	59·02	16	66·49	124	63·52
50s ..	22	63·2	98	64·44	22	59·22	110	62·03	35	62·83	134	64·22
46s ..	36	66·64	122	66·91	16	65·01	13	65·23	3	67·	29	67·83
44s ..	6	70·97	25	67·05	..	..	..	..	..	..	..	..

The Leicester crosses are again the lowest on the list; taking grade for grade the Border Leicester substantially holds its own in competition with the Lincoln, although it looks as though in the aggregate the Lincoln cross will give the highest return, owing to the greater proportion of the coarser grades. The extent to which these considerations operate is indicated in the following summary, showing the average clean yield from all grades in the case of the three crossbreds at Wagga:—

Cross.	Wethers.		Ewes.	
	No.	Yield.	No.	Yield.
		per cent.		per cent.
L_1M ...	89	64·67	340	64·66
L_2M ...	109	58·31	439	58·33
L_3M ...	116	62·35	608	62·51

The results still show marked consistency. The differences between the Lincoln and Leicester crosses are even greater than in the case of the Bathurst sheep alone, and are very similar in the case of the Border Leicester.

The following table presents the percentage yields of the different counts as recorded at Cowra:—

Count.	Lincoln-Merino.				Leicester-Merino.				Border Leicester-Merino.			
	Wethers.		Ewes.		Wethers.		Ewes.		Wethers.		Ewes.	
	No.	Yield.	No.	Yield.	No.	Yield.	No.	Yield.	No.	Yield.	No.	Yield.
		per cent.		per cent.		per cent.		per cent.		per cent.		per cent.
58s	..	..	3	52·18	10	54·4	159	54·63	17	60·14	97	60·26
56s	16	56·92	92	59·31	34	58·07	177	60·03	35	60·91	110	61·21
54s	14	59·92	96	61·5	20	61·18	151	61·28	16	58·82	86	61·35
50s	35	64·47	171	62·59	24	63·45	98	62·96	17	64·9	92	63·76
46s	36	65·04	149	64·25	..	..	14	66·25	6	63·57	16	64·41
44s	2	67·8	26	66·36	..	..	..	..	..	..	1	75·0
40s	..	..	3	72·3	..	..	..	..	..	..	..	..

Contrasting the results from the three farms, there appears to be little to distinguish the figures obtained in one district from those in another. It would appear as if the cross that would do in the one locality would serve equally as well in the others. If there is anything to choose, the best results have been shown by the Border Leicester crosses at Bathurst, but this is only in keeping with the higher returns recorded from this cross practically right through the trials. The following is a condensation of the averages at Cowra Farm :—

Cross.	Wethers.		Ewes.	
	No.	Yield.	No.	Yield.
		per cent.		per cent.
L_1M	103	62·94	540	62·18
L_2M	88	59 94	599	59·56
L_3M	91	61·31	402	61·51

Here the Lincoln cross again shows an appreciably higher yield than the Leicester, whereas the differences between the Lincoln and Border Leicester cross yields are very slight.

To bring the results to a final conclusion on this point the averages are consolidated as follows :—

AVERAGE Percentage of Clean Yield return from wool of different grades at Bathurst, Wagga and Cowra Experiment Farms.

Count.	Lincoln-Merino.				Leicester-Merino.				Border Leicester-Merino.			
	Wethers.		Ewes.		Wethers.		Ewes.		Wethers.		Ewes.	
	No.	Yield.	No.	Yield.	No.	Yield.	No.	Yield.	No.	Yield.	No.	Yield.
		per cent.		per cent.		per cent.		per cent.		per cent.		per cent.
58s	..	..	4	53 27	21	54·23	312	55·97	70	61·0	289	59·76
56s	32	57·57	183	58·83	114	57·36	432	58·86	120	62·05	414	61·65
54s	43	61·0	176	62·14	50	60·35	261	60·48	42	63·21	269	62 93
50s	100	64·18	359	62·93	111	62·72	290	62·56	82	64·81	294	64·39
46s	142	66·66	377	65·46	17	65·15	31	65·53	9	64·71	62	66·54
44s	20	70·84	74	68·0	..	..	..	..	..	..	..	..
40s	..	..	3	72·3	..	..	..	..	..	..	.	..

From the above we get the following digest of the returns :—

Cross.	Wethers.		Ewes.	
	No.	Yield.	No.	Yield.
		per cent.		per cent.
L_1M	337	64·50	1,176	63·20
L_2M	313	59·95	1,326	59·46
L_3M	323	62·80	1,329	62·18

The Value of the Wool.

We have now to consider the value of the wool produced by the various crosses, and to assess this with a measure of accuracy we have to take both quality and yield into account. We have already seen that, though the wool of the Leicester cross was, on the whole, finer than that of the other two, it was still lower in clean yield. What now remains to be proved is whether the finer wool of this cross compensates for the deficiency in actual yield, or whether the greater yield of pure wool from the Lincoln cross makes up for coarseness of quality. Moreover, it is necessary to inquire whether the Border Leicester cross—between the two in both quality and clean yield—will not be more valuable than either of the others.

In assessing the intrinsic value of the wool, the factors that influence values have all to be kept in association with one another. The clean yield cannot be separated from the quality of the wool, nor *vice versa*, nor can the greasy value be dissociated from the " top " or clean-scoured value, all these factors being in a sense contingent one upon another. In the table setting out the values of the wool from Bathurst Experiment Farm as "greasy" and as "top," the "top" rates have been taken as a basis of calculation and comparison up to 1915; but since then the basis adopted has had to be "clean scoured," the change being necessitated by the action of the Federal authorities in taking over, on behalf of the Imperial Government, the entire wool clip of the Commonwealth. Prior to this, the method of disposal was to offer the wool " under the hammer," chiefly in the markets of the Commonwealth, where the bulk of the wool is sold, the leading manufacturers of practically all countries being represented in the bidding. Under this system " top " rates, governed mainly by values ruling abroad, were made the basis upon which the greasy as well as the scoured values were fixed. But under the acquisition scheme, partly because for the time being no set market for " tops " ruled, and partly because the bulk of the wool was being absorbed for army requirements, " clean scoured " supplanted the " top " basis of values to facilitate the work of appraisement.

Now, as anybody who has had wool to sell can tell, these rates are subject sometimes to minor, and sometimes to very considerable fluctuations, if not from month to month, at all events during the same year. To enable the values to be uniformly comparative, however, the rates current for different grades at the close of each year have been taken. This allows for the wool being bought in Australia, and the " tops " prepared in Bradford, and it covers all expenses from the greasy state.

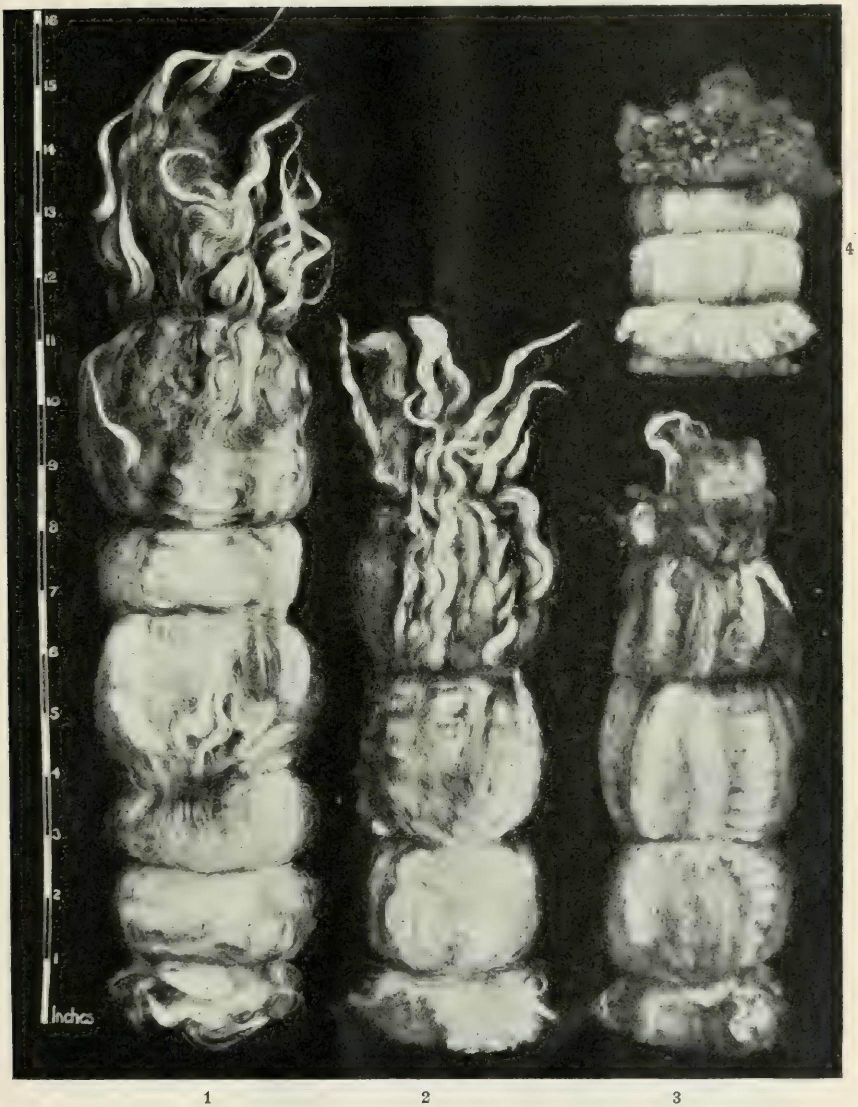
The uniform rates which have been maintained for wool of different grades since the scheme began to operate has certainly facilitated the work of computing and recording the wool values in these trials. There is, however, another point upon which a distinction should be made before values are set out more particularly, and that is the grade or type of wool upon which valuations have been based. In the schedule which has been prepared and provided for the work of appraisement, a distinction has been made for certain definite or main classes of wool, which are referred to as "types." A "type" may be representative of any specific grade or quality of wool, but differing in breeding, quality of texture, "condition," and ultimate manufacturing value. For example, two classes of wool may be similar in quality as to degree of fineness or coarseness, but they may also differ in such essentials as uniformity of growth, proportionate length of staple in accordance with the grade, colour, condition (whether light or heavy), or freedom from earth, vegetable matter and other substances that tend to detract from its appearance and general utility. This applies in the broader sense, though more correctly speaking, certain main distinctions have been made in providing for the districts where the types may be grown.

The types for crossbreds are, broadly speaking, designated as "extra super," "super," "good," "ordinary," and "inferior." The three former classifications apply to a greater or lesser degree to those classes which are grown in districts of cooler temperatures and higher rainfall, where the wool is less affected by dust and vegetable matter, and where the sheep are well nourished, the supply of food being more regular. The last two classes consist chiefly of those classes which are grown under less favourable circumstances, the conditions being hotter or the sheep indifferently bred, the wool more or less charged with earth and vegetable matter, and marketed in a mixed state, such as is only too often the case with small clips, and especially those coming from the wheat areas. Having been raised as part of and in connection with a system of mixed farming, the wools in these trials have been included in the latter category, and values have been based on those ruling for "ordinary." In setting out the values the same plan is adhered to as previously, the returns being first shown for each of the farms separately, and then all three farms combined.

The first table of this series records the values of the different grades produced at Bathurst Experiment Farm during the period 1912 to 1918 inclusive.

Count.	Lincoln-Merino.				Leicester-Merino.				Border Leicester-Merino.			
	Wethers.		Ewes.		Wethers.		Ewes.		Wethers.		Ewes.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.
		d.		d.		d.		d.		d.		d.
58s	.	..	..	..	..	..	45	17·34	32	19·26	63	18·31
56s	10	14·18	56	14·56	41	14·84	133	15·52	44	16·13	112	15·62
54s	10	15·92	21	16·58	9	13·5	24	16·1	10	17·31	59	16·55
50s	43	15·51	90	14·41	65	15·60	82	14·92	30	15·36	68	15·1
46s	70	12·79	106	13·61	1	15·57	4	9·25	..	..	17	10·53
44s	12	14·4	23	13·62	..	..	..	..	..	..	..	..

It would be well, perhaps, to read the above table in combination with the larger one, especially as the values varied from year to year according to seasonal conditions and differing values for the same grades in different years.

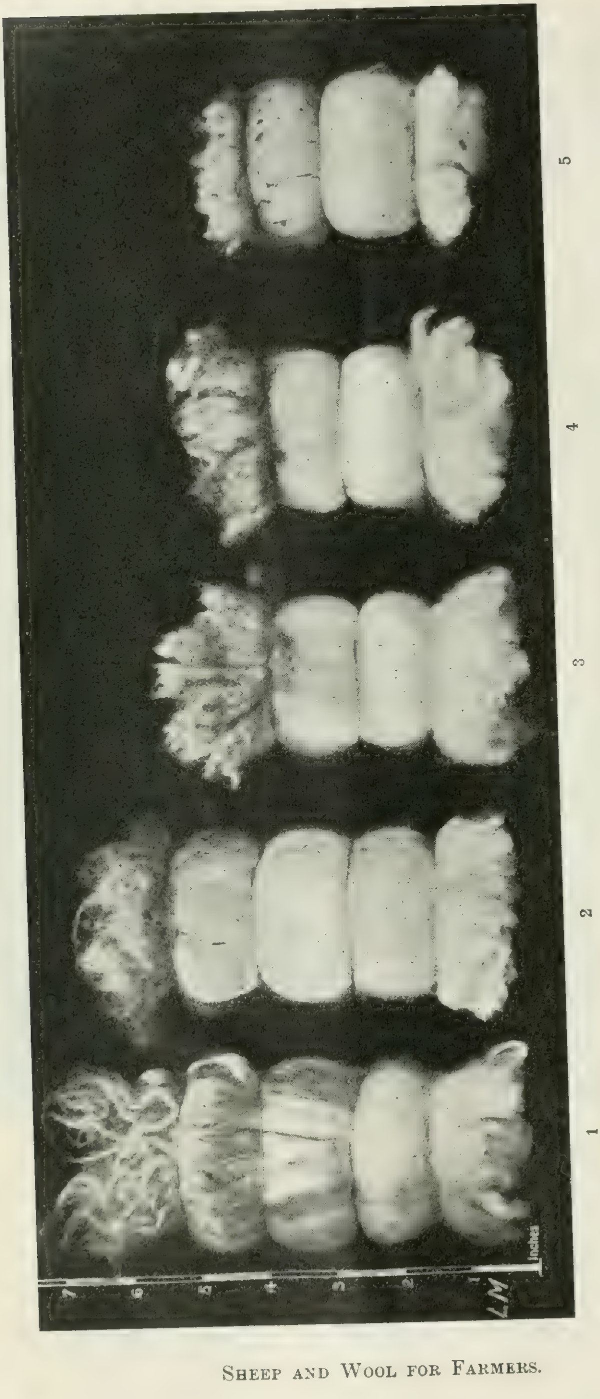


Cross-breeding Experiments for Wool and Mutton.

Qualities of wool from Sires and Dams expressed in "counts."

1. 36's. Lincoln Ram (L_1).
2. 40's. English Leicester Ram (L_2).
3. 44's. Border Leicester Ram (L_3).
4. 60's. Merino Ewe (M).

SHEEP AND WOOL FOR FARMERS.



Cross-breeding Experiments for Wool and Mutton.

Qualities of Lincoln-Merino (L_1M) wool expressed in "counts."

1. 44's. (Coarse to medium crossbred.) 2. 46's. (Medium crossbred). 3. 50's. (Medium to fine crossbred). 4. 54's. (Medium to fine crossbred).
5. 56's. (Fine crossbred).

SHEEP AND WOOL FOR FARMERS.

A summary of these returns is presented in the following :—

Cross.	Wethers.		Ewes.	
	No.	Value.	No.	Value.
		d.		d.
L_1M	145	14·04	296	14·25
L_2M	116	15·18	288	15·60
L_3M	116	16·89	319	15·94

On these results the Border Leicester cross is ahead in both instances, having 2·85d. advantage over the Lincoln for the wether wool, and 1·65d. in the case of the ewes. The Leicester is slightly ahead of the Lincoln cross in both wethers and ewes, and the difference between the Leicester and Border Leicester crosses is also not very great. In order to carry the result to a further stage of completeness, we will look at the returns which have been furnished in similar connections by Wagga and Cowra Farms.

The first is for Wagga Experiment Farm :—

Count.	Lincoln-Merino.				Leicester-Merino.				Border Leicester-Merino.			
	Wethers.		Ewes.		Wethers.		Ewes.		Wethers.		Ewes.	
	No.	Value.	No.	Value.	No.	Value.	No	Value.	No.	Value.	No.	Value.
		d.		d.		d.		d.		d.		d.
58s	..	..	..	..	11	14·85	108	16·53	21	18·	129	17 01
56s	6	13·91	35	15·58	39	13·37	122	14·50	41	14·56	192	15·32
54s	19	16·2	59	16·	21	14·43	86	14·83	16	16 66	124	16·73
50s	22	13·80	98	14·41	22	11·24	110	12·	35	12·45	134	12·
46s	36	12·65	122	10·96	16	9·67	13	8·6	3	9·	29	11·40
44s	6	10·81	25	10·51	..	..	..		..	..	..	..

The Border Leicester cross is again to the fore in respect of both ewes and wethers. A slight inconsistency is shown in the case of the Leicester, and the differences are more clear in the following summary :—

Cross.	Wethers.		Ewes.	
	No.	Value.	No.	Value.
		d.		d.
L_1M	89	13·46	340	13·27
L_2M	109	12·86	439	14·29
L_3M	116	14·7	608	14·89

The lower range of values shown in the case of this farm, as compared with Bathurst Farm, is not wholly attributable to the wool being less valuable, but to the fact that the experiments commenced a year earlier, and in consequence the results were handicapped by the lower range of values that ruled for that year.

Similar particulars for Cowra Experiment Farm are presented in the appended table :—

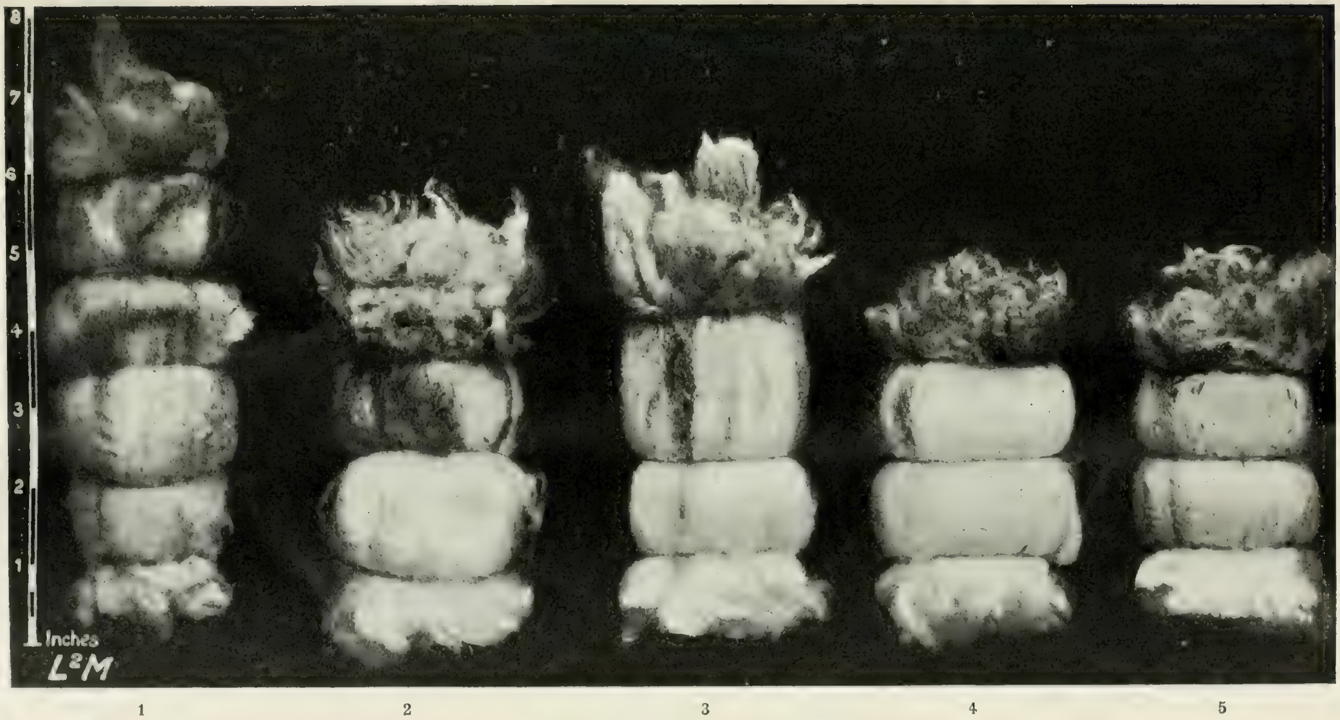
Count.	Lincoln-Merino.				Leicester-Merino.				Border Leicester-Merino.			
	Wethers.		Ewes.		Wethers.		Ewes.		Wethers.		Ewes.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.
		d.		d.		d.		d.		d.		d.
58s	..	..	3	16·17	10	13·94	159	14·58	17	17·81	97	17·68
56s	16	13·71	92	14·15	34	14·72	177	14·0	35	14·64	110	15·01
54s	14	16·33	96	15·68	20	15·39	151	15·70	16	14·85	86	15·51
50s	35	14·34	171	14·68	24	15·10	98	14·62	17	14·51	92	14·
46s	36	13·05	149	13·17	..	..	14	14·27	6	12·33	16	12·02
44s	2	13·37	26	12·52	..	..	..	..	..	..	..	..
40s	..	..	3	15·25	..	..	..	..	..	..	..	..

It will be seen on study of these figures that a higher value has been consistently recorded for the 54s quality or grade than its position in the order of "count" would suggest. This, however, does not imply that that particular grade of wool is more valuable than those which are really finer. It is due to what can be attributed now to a regrettable oversight. This sort was not included in the list of standards to which the fleeces were classed till 1914, and in consequence it has participated in the higher range of values which have been maintained since that year. However, the values on the whole have nowise been affected by its inclusion, as the consistency which is revealed in the following summary goes to prove :—

Cross.	Wethers.		Ewes.	
	No.	Value.	No.	Value.
		d.		d.
L_1M	103	14·09	540	14·18
L_2M	88	14·89	599	14·17
L_3M	91	15·09	402	15·41

The results again show uniformity, and probably they afford the best indication we have had yet of the relative value of the competing strains. Moreover, a larger number of ewes was employed here than at either of the two other places, and Cowra represents a climate between the Bathurst tablelands and the drier and hotter plains of eastern Riverina.

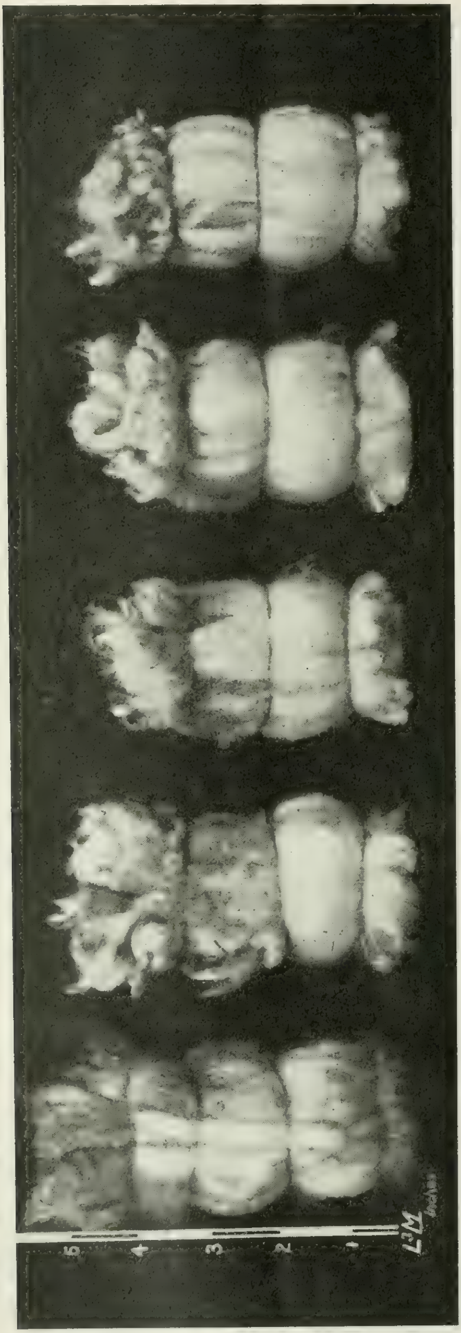
The final averages of the wool values of all three farms are presented in the next table.



Cross-breeding Experiments for Wool and Mutton.

Qualities of English Leicester-Merino (L_2M) wool expressed in "counts."

1. 46's. (Medium crossbred.) 2. 50's. (Medium to fine crossbred.) 3. 54's. (Medium to fine crossbred.) 4. 56's. (Fine crossbred.
5. 58's. (Superfine crossbred.)



Cross-breeding Experiments for Wool and Mutton

Qualities of Border Leicester-Merino (L$_3$M) wool expressed in "counts."

1. 46's. (Medium crossbred.) 2. 50's. (Medium to fine crossbred.) 3. 54's. (Medium to fine crossbred.) 4. 56's. (Fine crossbred.) 5. 58's. (Superfine crossbred.)

SHEEP AND WOOL FOR FARMERS.

AVERAGE Values of Different Grades of Wool, based on clean scoured returns, in respect of cross-breeding trials at Bathurst, Wagga and Cowra Experiment Farms:—

Count.	Lincoln-Merino.				Leicester-Merino.				Border Leicester-Merino.			
	Wethers.		Ewes.		Wethers.		Ewes.		Wethers.		Ewes.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.
		d.		d.		d.		d.		d.		d.
58s	..	..	4	15·	21	14·42	312	15·61	70	18·53	289	17·55
56s	32	13·89	183	14·55	114	14·31	432	14·63	120	15·16	414	15·32
54s	43	16·17	176	15·89	50	14·65	261	15·46	42	16·12	269	15·93
50s	100	14·72	359	14·51	111	14·74	290	13·71	82	13·95	294	13·32
46s	142	12·81	377	12·57	17	10·02	31	11·21	9	11·22	62	11·37
44s	20	13·22	74	12·18	..	..	..	..	..	..	1	15·
40s	..	..	3	15·35	..	..	..	..	..	..	..	..

Once again the main factors appear in the usual relations to one another. The quality of the wool, it will be seen, is uniform with its clean yield, or in other words, the finer the wool the greater the amount it loses in scouring. It is further apparent that the fineness of the wool is the dominating consideration in determining the value, for in all but a few cases the fine wool proved the most valuable, despite the fact that its yielding value was consistently lower.

The following brief table summarises the whole of the foregoing as to the comparative values of the wool of the three crosses.

Cross.	Wethers.		Ewes.	
	No.	Value.	No.	Value.
		d.		d.
L_1M ...	337	13·94	1,176	13·93
L_2M ...	313	14·28	1,326	14·71
L_3M ...	323	15·61	1,329	15·30

From this we may safely deduce that Border Leicester cross wool is on the average about 1½d. per lb. more valuable than Lincoln cross wool, and about ½d. per lb. more valuable than Leicester wool. In these tests no distinction has been made between the wools as to their general excellence. They have been put on the same basis throughout; but from personal observation the impression gained, as the result of long and careful handling, was that the Border Leicester cross displayed on the whole the best class of wool.

Having brought the results up to this stage, the next step is to see to what extent weight of body and weight of fleece can be reconciled with wool and mutton value combined. Those final returns will form the subject of a separate article.

(*To be continued.*)

Note on the F.A.Q. Wheat-sample (1918-19 Harvest).

WITH A COMPARISON WITH PREVIOUS YEARS.

F. B. GUTHRIE and G. W. NORRIS.

FOR many years the Grain Trade section of the Sydney Chamber of Commerce has fixed a standard of fair average quality of the grain in each season for the convenience of shippers and merchants. Samples of grain from every reliable source representative of the different districts were collected and carefully examined, and from them a sample of about 10 bushels selected as representative of the average quality of the grain available for that particular season. The bushel weight of this sample was taken as a basis for trade operations. In addition to this, a sample has been taken and milled in the Departmental model mill; and a further sample graded showing the size and quality of the grain.

The results of the milling and grading tests for the past ten years are also presented herewith in the hope that they may prove useful to those who are interested in the quality of our wheat.

REPORT ON SAMPLE OF F.A.Q. WHEAT REPRESENTING THE HARVEST OF 1918-19.

Appearance of grain—Light amber, plump, large, soft, opaque.		
Weight per bushel (lb. per bushel) ...		62·5
Ease of milling—Easy to mill.		
Percentage of mill products	Flour ...	71·0
	Pollard ...	12·0
	Bran ...	17·0
Nature of Flour.	Colour of flour—Excellent.	
	Strength of flour (in quarts per sack of 200 lb.)	44·6
	Percentage of dry gluten ...	10·1
	Character of wet gluten—Yellow colour, elastic, coherent, soft.	

Analysis of above Wheat.

Moisture ...	10·00 per cent.		
Albuminoids ...	11·81 ,,	Albuminoid ratio ...	1 to 6·5
Ether Extract	2·24 ,,	Nutritive value ...	89·6
Ash ...	1·42 ,,		
Fibre ...	1·79 ,,		
Carbohydrates	72·74 ,,		
	100·00		

COMPARISON of Results of Milling the F.A.Q. Wheats, 1910–1919.

Year.	Weight per Bushel.	Yield of Flour.	Strength. (Water absorption, quarts per 200 lb. sack.)	Dry Gluten.	Year.	Weight per Bushel.	Yield of Flour.	Strength. (Water absorption, quarts per 200 lb. sack.)	Dry Gluten.
	lb.	per cent.		per cent.		lb	per cent.		per cent.
1909–10	62	70·1	48 0	10·4	1914–15	60½	70·3	47·5	12·9
1910–11	62¼	70·0	45·0	10·2	1915–16	61	72·6	45·0	11·4
1911–12	61½	72·8	45·0	11·9	1916–17	56¾	69·7	41·5	8·3
1912–13	62¼	70·3	46·0	11·9	1917–18	58½	70·7	43·8	9·1
1913–14	64	70·0	45·0	11·5	1918–19	62½	71·0	44·6	10·1

Result of Grading the F.A.Q. Samples from 1910–1919.

Year.	Grade												Broken and Pinched Grain.		Oats, White-heads, &c.		Total.	
	3·25 mm.		3·00 mm.		2·75 mm.		2·50 mm.		2·25 mm.		2·00 mm.							
	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
1909–10 ..	0	13	3	7	11	9	19	8	18	12	4	13	2	3	0	15	62	0
1910–11 ..	1	12½	5	10¼	13	0	14	11½	20	15½	2	15	2	0	1	3¼	62	4
1911–12 ..	0	5½	2	6½	12	9½	18	13¼	19	8¾	5	2¾	2	1¼	0	8½	61	8
1912–13 ..	....		0	11¾	7	0	22	1½	24	15¾	5	3	1	8	0	12	62	4
1913–14 ..	....		1	7	10	8½	20	14¾	23	2¼	5	0	2	8	0	7½	64	0
1914–15 ..	....		0	12	12	1½	17	0¼	21	2¾	7	3	1	8½	0	12	60	8
1915–16 ..	....		0	10¼	5	8¾	18	11¼	26	3¼	5	11¾	3	8¼	0	10¼	61	0
1916–17 ..	....		0	3¾	4	2½	10	3¾	11	0	23	5½	7	3	0	9¾	56	12
1917–18 ..	....		1	7¾	9	5	12	7¼	25	13	6	5¼	2	2¾	0	15	58	8
1918–19 ..	....		0	6¼	13	1½	33	15¾	7	13	2	8½	4	4¾	0	6¼	62	8

Remarks on the F.A.Q. Standard for 1918–19.

The quality of the wheat this year shows a marked improvement on that of the last two seasons. The yield of flour is satisfactory, and when milled upon a large scale another 1 per cent. should easily be obtained.

When compared with the past two seasons the flour is much superior, being richer in gluten with a higher water absorption.

Upon examining the different grades extending over the last ten years, it will be noticed that the 3·25 mm. grade has disappeared since the year 1912, while the bulk of this year's sample is between 2·5 and 2·75 mm.

This reduction in the size of the grain may probably be due to the increased popularity of the Federation variety, which produces a grain on the average about 2·5 mm. in size.

In further support of this suggestion, it will be noticed in the accompanying table that there is a gradual decrease in the quality of the flour. This diminution might reasonably be attributed to the preponderance of this variety, as Federation has produced a large number of different strains, some of which yield flour of somewhat poor quality.

With the increased use of machinery in the baking trade this falling-off in quality of the flour is undoubtedly to be regretted, as the machine and manual labour both turn out a better loaf when the flour used contains a good quality gluten.

Fortunately, this matter should right itself in the near future, as several wheats which have been standing their trial from a yield point of view are superior in quality to Federation, and should become popular with the wheat growers as soon as the results of these field-trials are known.

Drought-resistant Grasses and Fodder Plants in the West.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

The season lately passed through has been one of the driest on record, and has afforded an excellent opportunity for observing the behaviour of grasses and fodder plants under drought conditions.

In spite of the claim repeatedly put forward in the past that our native grasses are superior in drought resistance to any introduced, an exception must now apparently be made in the case of Sudan grass. That this grass was resistant to dry weather was already known, but that it would thrive and produce good feed during a summer such as the last was hardly anticipated. Yet it did so.

During the six months October to March inclusive, the rainfall at Bathurst Experiment Farm was 587 points, as against 1,653 points for a similar period during the 1917–18 season. The Sudan grass sown in October has been repeatedly grazed by sheep, not a full leaf being discernible when they had finished with it. Each time when the sheep were removed the grass again shot away, and at the time of writing (April) the paddock provided a remarkable sight in a district where green grass is at present non-existent. A heavy crop of seed is certain; and it is no exaggeration to say that, if cut for hay, it would easily yield 1 ton to the acre. No native grass in the seed reserve plots has matured seed to any extent, while most have failed to do so altogether.

At the Women's Training Farm, Cowra, the rainfall was less than that at Bathurst, and the evaporation greater. Yet even here the plot of Sudan grass provided a fair amount of feed for stock in the first growth, and yielded a good quantity of seed in the second growth. At the present time the aftermath from the second cut is being fed off.

The palatability and drought resistance of Sudan grass in the western districts have now proved to be so good that it will be surprising if farmers do not grow it largely in the future.

Both at Bathurst and Cowra, Elephant grass has made a remarkable growth, being 2 feet high, with as many as fifty stalks to a plant. In a palatability test at Cowra, both sheep and cattle ate it right down to the ground. More data are wanted, however, before farmers can be recommended to plant it on a large scale in the interior.

At Cowra, Rhodes grass has once again come up to expectations in providing good feed during the summer months. After six months of drought, the lucerne grown with the grass was completely withered off while the Rhodes grass was quite green and growing vigorously. It is only fair to say that the paddock was not heavily stocked, and its vigour under such conditions has yet to be determined. From a general observation, it would not produce as much feed as some of the native grasses described below.

At Bathurst and Cowra, Coolah grass has maintained a most remarkable vitality, but it was noticeable that the leaf growth fell off considerably, the plant having a tendency to run into rather coarse stems. At Bathurst it matured a small quantity of seed and attained a height of 2 feet. Young plants planted out at Cowra last September grew right through the drought, and hardly one has succumbed. This is a really remarkable achievement that enhances the reputation of the grass.

Sudan Grass in a Dry Season at Bathurst Experiment Farm.

The stand had been fed off several times before this photograph was taken.

Other native grasses which have also withstood the dry conditions very well are Warrego, Summer grass (*Panicum flavidum*), Sugar or Brown Top grass (*Erianthus fulvus*), and Native Millet (*Panicum decompositum*). It was again noticed that Queensland Blue grass is not drought-resistant, the flag having completely died, while Wallaby or White Top (*Danthonia semi-annularis*) died off at the top, but remained green at the butt.

The grain sorghums have again maintained their reputation for remarkable drought-resistant characteristics. Kaoliang sorghum comes first in this respect, and also possesses the advantage of being early maturing. Good crops of seed were obtained from it at Cowra, while at Bathurst it yielded 10 to 12 bushels per acre. This is certainly low, but that seed should have matured

Sugar or Brown Top Grass (*Erianthus fulvus*) **at Bathurst Experiment Farm.**

Coolah Grass (*Panicum prolutum*) **at Cowra Women's Training Farm.**

DROUGHT-RESISTANT GRASSES AND FODDER PLANTS IN THE WEST.

at all is remarkable,—and the more so, when not a solitary cob could be obtained from the maize planted at the same time. Milo yielded slightly heavier than Kaoliang at Bathurst, but lighter at Cowra. Feterita at Cowra yielded a small quantity of seed, but at Bathurst it proved too slow-maturing to do so. With an ordinary rainfall Feterita, in the past, has matured seed as early as, and even earlier than, Milo, which seems to indicate that it requires more rainfall than Milo or Kaoliang in order to produce satisfactory results.

An interesting feature in connection with these sorghums was noticed during the past season It had been known previously that they remained green up to the stage of maturity of the seed, but their palatability for stock had never definitely been ascertained. On grazing the sorghums at Cowra and Bathurst after the seed had been removed, it was noticed that Amber Cane was preferred to the others, then Feterita, Milo, and Kaoliang in that order. The stalks, as well as the flag, of Milo and Feterita were readily eaten, but the stalks of Kaoliang, owing probably to their pithy character, were left untouched. It is satisfactory to know that in addition to the grains from these sorghums, which possess a high nutritive value, a good deal of roughage is left behind which provides fair picking for some considerable time.

THE PICKLING OF OLIVES.

IN reply to a correspondent who wished to know how to treat olives for table use, the Under Secretary and Director stated that the olives should be picked at the stage when they are turning from green to purple, though ripe olives may be used. Place them in earthenware jars or glass vessels, these being most suitable for small lots. Cover the olives for the first time with a solution containing 2 oz. of caustic soda (Greenbank's), and 3 oz. of salt to 1 gallon of water. Allow this to stand for 24 hours.

Change to a brine 3 oz. salt to 1 gallon water ; stand for 24 hours.
" " 4 " " 1 gallon water ; " "
" " 5 " " 1 gallon water ; " "
" " 6 " " 1 gallon water ; stand for 48 hours, or longer.
" " 8 " " 1 gallon water.

The last is the permanent solution. The olives should at all times be kept below the solution during the pickling process and afterwards.

PEACH LEAF CURL.

NEXT month will be time enough to apply the lime-sulphur spray (winter strength) on most varieties of peach and nectarine trees for leaf curl, but some of the early blossomers, such as Bell's November and Edward the Seventh, should receive this dressing during this month. Many trials have proved the utility of the winter applications of lime-sulphur for this disease. —W. J. ALLEN.

The Mixing of Sprays.

A. A. RAMSAY, Assistant Chemist.

THE question of combining insecticides and fungicides in the treatment of orchard pests is attracting more and more attention, for the very obvious reason that such combinations may represent substantial savings both in time and in money.

A previous article on the double-purpose spray* indicated that lead arsenate and Bordeaux mixture, as well as lead arsenate and lime-sulphur, could safely be used as a combined spray; but since the publication of that

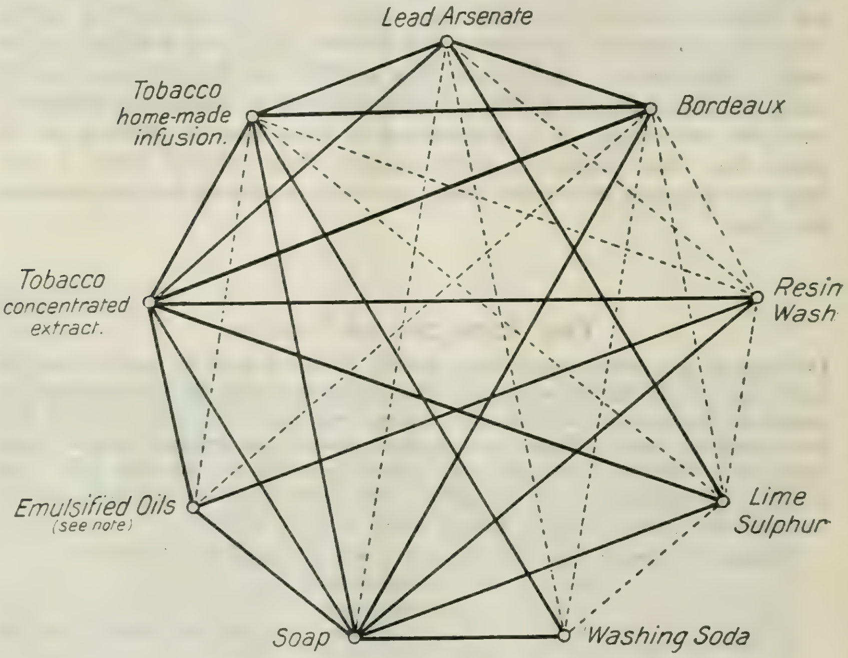

Lead Arsenate
Tobacco home-made infusion.
Bordeaux
Tobacco concentrated extract.
Resin Wash
Emulsified Oils (see note)
Lime Sulphur
Soap
Washing Soda

Diagram indicating the compatibility of Orchard Sprays.
Lines connected by a thick black line may be mixed together.
Lines connected by a dotted line *should not* be mixed together.

NOTE.—It will be seen that the mixing of emulsified oils with various spraying materials has not been recommended. The group "emulsified oils" includes (*a*) kerosene emulsion, and (*b*) certain proprietary products sold under registered names. In the case of the former, the addition of solid matter in suspension (such as lead arsenate) does not break up the emulsion, but the interaction of the soap and the lead arsenate tends towards the formation of alkaline arsenic compounds which are soluble in water and which are injurious in proportion to the amount formed.

In the case of (*b*) (the proprietary products), the addition of solids like lead arsenate does break up the emulsion, with the result that free oil is produced, which is injurious. In addition to this danger, alkaline arsenic compounds will also be produced, which are injurious as in the previous case.

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* "The Double-purpose Spray." A. A. Ramsay, *Agric. Gaz.*, vol. 28, page 435.

article the question of the possibility or otherwise of mixing together certain sprays has frequently been raised, and the accompanying diagram has been prepared to indicate what sprays may be safely mixed together, and also what may not. It is hoped the diagram will be of assistance to fruit-growers.

Only such spraying materials as are in general use in actual field practice in this State have been dealt with in the diagram, with the object of securing greater clearness in the diagram and to facilitate its use.

The mixed spray kerosene emulsion plus lead arsenate, if used at once after mixing, is suggested as possible, but extreme caution should be used until field trials confirm such practice.

For the information of orchardists who may desire to try sprays which have been used elsewhere, though not widely used, a supplementary table has been added to indicate what mixtures may safely be made, and also what mixtures should not be made.

TABLE of Compatible and Non-compatible Sprays.

Spray.	May be mixed with—	Must not be mixed with—
Alkali sulphides (liver of sulphur.)	Soap, washing soda.	Bordeaux, Burgundy, lead arsenate, Paris green.
Ammonia copper carbonate.	Tobacco infusions (home-made, according to the Department's formula), concentrated tobacco extracts.	Bordeaux, Burgundy, lead arsenate, Paris green.
Bordeaux mixture ..	Lead arsenate, Paris green, concentrated tobacco extracts, tobacco infusions (home-made, according to the Department's formula), soap.	Alkali sulphides, lime-sulphur, certain oil emulsions, resin wash (home-made), washing soda.
Burgundy mixture ..	Concentrated tobacco extracts.	Alkali sulphides, lead arsenate, lime-sulphur, Paris green, resin wash, soap, washing soda.
Ferrous sulphate and sulphuric acid.	To be used alone.	
Iron sulphide	Bordeaux, lime-sulphur.	
Lead arsenate	Bordeaux, lime-sulphur, sulphur (atomic), concentrated tobacco extracts, tobacco infusions (home-made, Departmental formula).	Ammonia copper carbonate, alkali sulphides, resin wash, soap, tobacco infusions (home-made, Departmental formula), washing soda.
Lime-sulphur	Iron sulphide, lead arsenate, concentrated tobacco extracts.	Bordeaux, Burgundy, resin wash, soap, tobacco infusions (home made, Departmental formula), washing soda.
Paris green..	Bordeaux, concentrated tobacco extracts.	Alkali sulphides, ammonia copper carbonate, resin wash, soap, washing soda.
Resin wash..	Kerosene emulsion, concentrated tobacco extracts.	Bordeaux, Burgundy, lead arsenate, lime-sulphur, Paris green, tobacco infusions (home-made, Departmental formula).
Soap	Alkali sulphides, Bordeaux, tobacco infusions (home-made, Departmental formula), concentrated tobacco extracts, resin wash, washing soda.	Burgundy, lime-sulphur, lead arsenate, Paris green.
Sulphur (atomic)	Lead arsenate, Paris green.	
Soap-oil emulsions ..	See foot-note to diagram.	
Tobacco extracts, concentrated.	Ammonia copper carbonate, Bordeaux, Burgundy, lead arsenate, lime sulphur, oil emulsions, resin wash, soap, tobacco infusions (home-made, Departmental formula), washing soda.	
Tobacco infusions (home-made, Departmental formula).	Ammonia copper carbonate, alkali sulphides, lead arsenate, soap, concentrated tobacco extracts, washing soda.	Lime-sulphur, lead arsenate, Paris green.
Washing soda	Alkali sulphides, emulsified oils, soap, concentrated tobacco extracts, tobacco infusions (home-made, Departmental formula).	Burgundy, Bordeaux, lead arsenate, lime-sulphur, Paris green.

The Packing of Fruit.

W. J. ALLEN and W. LE GAY BRERETON.

LAST month some primary considerations in the numerical method of packing fruit were discussed under the heading of "Orchard Notes," but the subject reserved for this month, the formation of the pack, has demanded more detailed treatment than was foreseen, and we proceed with it under the above heading.

To facilitate the following directions, it will be assumed that the pack is started in each instance in the left-hand corner of the case at the end nearest the packer, though, of course, if preferred, the packer can start in the right-hand corner.

The 2–1 *Pack.*—Place No. 1 fruit in the left-hand corner of the case at the end nearest the packer, No. 2 in the right-hand corner (Nos. 1 and 2 thus form the first cross row of the case), and No. 3 in the space between and touching Nos. 1 and 2, though, of course, the space between Nos. 1 and 2 is not large enough to let No. 3 come right back and touch the end of the case; No. 3 thus forms the second cross row. No. 4 is placed in the space between No. 3 and the left-hand side of the case, and No. 5 in the space between No. 3 and the right-hand side of the case. Continue in this way, keeping as near as is practicable to the size that you started with, till the other end of the case is reached. Each fruit should be brought up firm against its immediate neighbour, but not unduly squeezed to cause injury or to bulge the sides of the case. Now, if when the end of the case is reached the last one or two fruits do not just fit in snug, an adjustment is necessary. If the space is too large, do not put in a fruit above the range of size you are packing, or if the space is too small, do not use a fruit below the range of size. Instead, if the space is slightly too small, look through the tier and pull out two or three fruits that seem rather larger than the others, and replace them with something smaller, but still within the range of size. Pull all up to their place again, and it will now be found that the end ones will just fit in snug. If the spaces, on the other hand, are slightly too large, just do the reverse. This adjustment evens up the sizing and automatically determines the size which is going to be packed, though the packer need not trouble about the actual dimensions of that size. After a few days' constant packing, it will be found that the first tier will pack in snug first hit, without any adjusting. If good, even sizing is maintained in the first tier, the sizing of the fruit in the succeeding tiers is simple, for if fruit out of the range of size is used it is very quickly manifested by its refusing to pack into the spaces correctly.

The second tier is started by placing No. 1 of that tier over the space between Nos. 1 and 2 of the first tier; No. 2 of the second tier is placed over the space to the left of No. 3 of first tier, and No. 3 of the second tier is placed over the space to the right of No. 3 of the first tier; No. 4 of the second tier is placed over the space between Nos. 4 and 5 of the first tier, and so on till the tier is complete, taking care that the fruit is taking the spaces left between the fruit of the tier below, and at the same time that each fruit is touching its immediate neighbour.

The third and following tiers will be made alternately like the first and second. It will be noticed in the chart that appeared in last month's notes, that the counts 45 to 75, inclusive of the 2–1 pack, are packed on the flat (on end). When packing on the flat (on the end), place the fruit with the stalk down. If some of the lower counts (larger sizes) are liable to run high, the height can be reduced to some extent by packing the top tier calyx down; the reason being that the tapering of the fruit towards the calyx, or eye, permits the fruit to fit down further into the spaces between the fruit in the tier below.

The higher counts (smaller sizes) of the 2–1 pack will not come high enough packed on the flat (on end), and they must be packed on edge (viz., cheek or side). From observation of the more commonly grown apples, this change has generally to be made on the 6–5 count of the 2–1 pack, and has been shown thus on the chart; but varieties might be met which are exceptionally flat or very tapering, in which case the change from flat to edge would start on a lower count. For this reason it is advisable, when the changing point is definitely ascertained for a certain variety, to note it on the chart card for future reference.

The first count packed on edge is liable to run high; for this reason it is packed "edge open." The fruit is packed 2–1, as already described, but is placed on edge with the stalk pointing towards the end of the case nearest the packer and the calyx towards the opposite end. This gives more space between the fruit and takes slightly smaller fruit to complete the tier (both conditions serving to reduce the height) than if the same count were packed "edge closed" or "angle placed." The closed packing will be described presently. It will be found that the highest count packed on the flat will be liable to run low. A packer will know the count as soon as he gets in his first tier, and knowing that it is liable to run low he will endeavour to "keep it up" by using fruit well up to size. He will also endeavour to keep the first count on edge down in height. Now, as a general rule, if a tier of fruit packed 2–1 on the flat is changed to "edge closed," it will give one count higher; thus, fruit of a size that will pack 5–5 "flat" will pack 6–5 on "edge closed"; but the same count (6–5) packed "edge open" will take slightly smaller fruit. What really occurs in these changes from "flat" to "edge open" is that the lower count is operating on the higher end of a range of size and the higher count on the lower end of the same range of size. Thus: if the count 5–5 packed flat, takes 3⅝ inches to 3½ inches "full," then the next count, 6–5, on "edge open," will take 3⅝ inches to 3½ inches "bare." Both will be called 3⅝-inch (see definition of range of size last month), but the "full" will contain a great deal of fruit of 3½-inches or nearly 3½ inches diameter, and the "bare" will contain very little fruit up to 3½ inches. It is generally only necessary to pack one count "open," the remaining higher counts of the 2–1 pack being packed "closed."

The closed pack of the 2–1 is carried out as follows:—Place No. 1 in the left-hand corner, No. 2 in the right-hand corner, as for the "edge open" pack, No. 3 between Nos. 1 and 2, but with stalk end against No. 1 or No. 2, and the calyx diagonally towards the right or left side of the case. With the flatter types, this will leave a larger space on one side of No. 3 than the other; and it is sometimes necessary to reverse alternately the diagonal direction of the apple forming the middle row of the pack, to prevent either one of the outside rows taking all the larger of the range of size. Place No. 4 stalk end against No. 3, and calyx diagonally towards the left side of the case, and No. 5 with stalk end against No. 3 and calyx diagonally towards the right side of the case. Continue the tier, alternately reversing the diagonal directions of the apples forming the middle row if necessary, and thus prevent all the larger of the range being on one side of the case. Some tapering varieties will pack just as close if the apples forming the centre row are placed with the stalk towards the end nearest the packer or *vice versa*, the apples forming the left-hand row with the calyx diagonally towards the left side of the case and apples forming the right-hand row with the calyx diagonally towards the right side of case. This makes a rather more attractive pack, but it cannot be employed for all varieties.

It will be seen on the chart that five counts are shown for packing 2–1 on edge. Now, each higher count takes a smaller range of size, yet all come to the desired height in five tiers, the reason being that smaller fruit pack closer, leaving less space between them, and the fruit of the tier above, being packed into the spaces between the fruit of the tier below do not let it down so far. But this only holds good to a degree, as in time a size will be reached that will not give the desired height in five tiers, even if the fruit were placed directly one over the other. When the highest count of the 2–1 pack that will come to the desired height "on edge" in five tiers in any particular variety has been definitely determined, note it on the chart card for future reference. This point will generally be reached on the 7–7 count when packing flat types of apples, and 7–6 count when packing long types of apples. The reason for this difference is that when packing "on edge," it takes a smaller apple of a long type to give the number in the longitudinal rows than it does a flat type; a long type 7–6 has a smaller transverse diameter than a flat type 7–6, and when packing on edge the transverse diameter controls the height. The reverse obtains when packing flat (which is not much required for the Australian bushel case), as the height of the apple, or the longitudinal diameter, controls the height of the pack.

Fruit that will not pack 2–1 in five tiers will be packed six tiers 2–2. The reason for changing the pack is that a size that would come too high in six tiers packed 2–1 will give the desired height when packed six tiers 2–2; the reason being that when packed 2–2 the spaces are larger than when the same size is packed 2–1, hence the fruit of the tiers packed into the spaces of the preceding tier is let down further.

If one should doubt that more space is given with the same sized fruit packed 2–2 than when packed 2–1, let him take a size that is not too small to make a 2–1 pack and not too large to make a 2–2 pack. Pack one tier of this chosen size in the bottom of a regulation case 2–1 "edge closed," so that the pack is as tight as possible without undue pressure on the fruit or causing the sides of the case to spring; take the count, remove the fruit, and pack one tier with the same fruit in the same case 2–2 "closed," so that the pack is as tight as possible without undue pressure on the fruit or springing the sides of the case, and it will be found that the tier will be completed 2–2 without using all the apples from the 2–1 tier. The same applies between the 2–2 and the 3–2, and between the 3–2 and 3–3 packs.

The 2–2 *Pack.*—To form the 2–2 pack, place No. 1 in the left corner of the case at the end nearest the packer, and place No. 2 between No. 1 and the right-hand side of the case, leaving a space on each side of it. This forms the first cross row, and Nos. 3 and 4 in their places form the next cross row. No. 3 goes between Nos. 1 and 2, and No. 4 between No. 2 and the right-hand side of the case, shifting No. 2 to the right or left so as to bring the line of Nos. 3 and 4 at right-angles across the case. This sets the longitudinal rows in their right position for the remainder of the tier, and it will be noticed that No. 2 is rather closer to No. 1 than to the right-hand side of the case. No. 5 is placed between No. 3 and the left side of the case, and No. 6 between Nos. 3 and 4, and so on till the tier is complete, keeping as even a size as is practicable, though it is not necessary for the packer to know the actual dimensions of the size. See that the last two apples just fit in snug into the last two spaces; if they do not, adjust as described for the first tier of the 2–1 pack. The second tier is packed over the spaces of the first tier, the third over the spaces of the second, and so on.

If a flat pack is being made, the fruit is placed stalk downwards throughout, except that the top tier may be placed calyx down to reduce the height if required as described for the 2–1 pack. But in the Australian bushel case, packing on the flat is not generally necessary, except for some of the lower counts of the 2–1 pack, and in the same case the edge is the rule for the 2–2 and 3–2 packs. As a rule, the lowest counts of the 2–2 pack (which will generally be found the 4–4 count for long type apples and the 5–4 count for flat type apples) are liable to run high, and must be packed "open edge." It might be noticed that here again we have two counts, one taking the top end of a range of size and the other the lower end, *i.e.*, if a flat type 2–1 by 7–7 takes 3 inches to 3⅛ inches full, then 2–2 by 5–4 "edge open" will take 3 inches to 3⅛ inches bare. Similarly, if a long type 2–1 by 7–6 takes 3 inches to 3⅛ inches full, then 2–2 by 4–4 "edge open" takes 3 inches to 3⅛ inches bare. To form the 2–2 "open edge," proceed as previously described for the 2–2 pack, except that the fruit is placed on edge and the stalk towards the end of the case nearest the packer and the calyx towards the opposite end. When it has been definitely ascertained on what 2–2 count a certain variety starts, mark it on the chart card for future reference, and also the count at which the closed packing starts.

To form the 2–2 "closed" or "angle-placed" pack, place Nos. 1 and 2 as described for 2–2 "edge open." Place No. 3 with the stalk end against No. 1 and the calyx diagonally towards the right side of the case; No. 4 with the stalk end against No. 2 and the calyx diagonally towards the right side of the case; shift No. 2, if necessary, to the left or right as described in forming the 2–2 pack. Place No. 5 with the stalk end against No. 3 and the calyx diagonally towards the left side of the case, and No. 6 with the stalk end against No. 4 and the calyx pointing diagonally towards the left side of the case, and so on till the tier is complete, observing the previous instructions regarding keeping to as even a size as possible and the fruit fitting in snug.

This style of turning is not the only one for forming the 2–2 closed pack, but it makes an attractive pack, and also, owing to its consistency, is easy to acquire and the packer will perform the turning almost automatically. The above turning applies only to apples which have a greater transverse diameter than their longitudinal diameter, but there are very few apples with which this is not the case.

There is one style of turning in the 2–2 pack which should be avoided, unless the apple is really higher than it is broad. It is as follows: If No. 3 is placed with the stalk towards No. 2 and the calyx diagonally towards the left side of the case, and No. 4 is placed with the stalk end against No. 2 and the calyx towards the right-hand side of the case, then the space between No. 3 and the left side of the case will be very much greater than the space between Nos. 3 and 4. This uneven spacing will cause the cross rows to incline towards one end of the case, and at the closing end one space will be large and the other small.

The 2–2 pack "closed" or "angle-placed" may be employed for flat types of apple until the 7–6 count is reached, and for long types till the 6–6 count is reached. Very flat apples, such as Magg's Seedling, will run to the 7–7, but the more commonly grown flat types, such as Dunn's, Jonathan, Stone Pippin, Rome Beauty and London Pippin, will not pack a higher count than the 2–2 x 7–6 in six tiers. Frequently where higher counts of these varieties packed 2–2 have been examined, they have been found too low after being given a very little time to settle, or even if pressed down with the hand directly after packing. When it has been definitely ascertained what is the highest count in which a certain variety will pack 2–2, it should be marked on the chart card.

When changing from 2–2 to the 3–2 pack, the counts will generally work one on each end of a range of size, as described when changing from 2–1 to 2–2. It might be mentioned that there is nothing intricate about this; in fact, it was only observed that such was the case when measuring the sizes of the fruit of several counts of packed cases at one of the Department's orchards, some seasons after the numerical system had been adopted.

The 3–2 *Pack.*—Sizes that will not come high enough in six tiers when packed 2–2 are packed 3–2 with seven tiers. The reason that the seven tiers can be put in when changing from 2–2 to 3–2 has already been explained in the change from the 2–1 to 2–2 pack.

To form the 3–2 pack, place No. 1 in the left-hand corner of the case at the end nearest the packer, No. 2 in the right-hand corner of the same end, and No. 3 directly midway between Nos. 1 and 2, and leaving more or less space on each side of it. Nos. 1, 2, and 3 form the first cross row of the case; No. 4 is placed in the space between Nos. 1 and 3, and No. 5 in the space between Nos. 3 and 2. Nos. 4 and 5 thus form the second cross row of the case. The packing of the rest of the case follows on these lines until the tier is complete, observing previous instructions about each fruit fitting in snug, and adjusting the first tier if necessary. The second tier is packed over the spaces of the first tier, the third tier over the spaces of the second, and so on in the usual way.

When packing on the flat the apples are all placed with the stalks towards the bottom of the case, except when it is desired to reduce the height. Then the top tier may be turned with the calyx towards the bottom, but fruit is seldom placed on the flat for the 3–2 pack in the Australian bushel case. The first count of the 3–2, usually the 4–4 for long type and 5–4 for flat type apples, is liable to run high and should then be packed "open"; to pack "on edge," place the fruit as already described for forming the 3–2 pack, but place them on edge with the stalk end towards the end of the case nearest the packer, and the calyx pointing towards the opposite end. It will generally only be necessary to pack one count "open"; the remainder will be "closed" to keep them high enough, and when it is definitely ascertained on what count a certain variety starts 3–2 "edge open" and on what count "edge closed," it should be noted on the chart card for future reference.

To pack 3–2 "edge closed," place Nos. 1, 3, and 2 on edge with the stalk end against the end of the case nearest the packer; place No. 4 with the stalk end against No. 1 and the calyx pointing diagonally towards the right-hand side of the case; place No. 5 with the stalk end against No. 2 and the calyx pointing diagonally towards the left-hand side of the case; place No. 6 with the stalk end against No. 4 and the calyx pointing diagonally towards the left-hand side of the case; No. 7 with the stalk end against No. 5 and the calyx diagonally towards the right-hand side of the case; No. 8 with the stalk end against No. 4 or No. 5, whichever will keep the spacing between Nos. 8 and 6 and Nos. 8 and 7 about equal. Often the direction of the apples forming the centre longitudinal row is reversed with the calyx pointing diagonally towards the left or right side of the case alternately, so as to keep the spacing uniform. With some shapes the apples forming the centre rows can be placed with stalk towards the end of the case, and the calyx towards the opposite end, or *vice versa.*

There is another turning of the apples which will work the spacing correctly when packing 3–2 "closed," but it is more intricate and not necessary. However, there is one turning which may be described, as it is a pit into which many beginners fall. It is as follows:—Nos. 1, 3, and 2 are placed as for the above, but No. 4 is placed with the stalk end against No. 3 and the calyx diagonally towards the *left*-hand side of the case; No. 5 is placed with the stalk end against No. 3 and the calyx pointing diagonally towards the *right* side of the case. The trouble is that such placing with flat type apples leaves very little space between Nos. 4 and 5 and big space between No. 4 and the left side of the case and No. 5 and the right side of the case. Consequently Nos. 6 and 7 draw closer to the packer's end of the case than No. 8 (the centre), and very soon the spacing becomes difficult to follow, and the tier will close with some spaces too large and some too small at the finishing end of the case. The most commonly grown flat types of apples will generally not pack a higher count than 6–6 in seven tiers. Where higher counts of the 3–2 are packed, if it is not an exceptionally flat apple, such as Magg's Seedling, it will be found on close examination that the pack is low and has been wadded up with wood wool or other packing, or else the case is not true to regulation size. Apples of smaller size than is necessary for these highest counts of the 3–2 pack are very tedious to pack, observing spaces, and the usual plan is to pack them on edge 3–2, but not to trouble about them spacing with the tier below, and to bring it to the desired height by turning the last one or two tiers on the flat if necessary, after the old method. This is, of course, departing from the numerical pack, and the count cannot be stamped on the case.

The "edge closed" packs are preferable to the "edge open" packs, because in the former when a tier is complete every apple will hold its position irrespective of the tier above, whereas in the latter the apples of the bottom and top tiers are only prevented from shifting out of position by the apples of the tier above or below, and the apples of the intermediate tiers by both the apples of the tiers above and below. When nailed down the "spring or bulge" of the top and bottom of the case must be sufficient to key the whole pack up tight; they are only used in counts that would otherwise be too high, and therefore the spring or bulge will be sufficient to do this. However, it is necessary that the sizing be more even, or there is a liability of the pressure from the spring of the top and bottom not gripping some fruit sufficiently, and of its being able to shake about in its place during transit. In all the packs, care should be taken that the fruit fits correctly into the spaces of the tier below; otherwise when being nailed down the bulge or spring of the top and bottom will cause uneven pressure on the fruit forming the space, perhaps all the pressure bearing on one fruit instead of on two or three, according to the position in and form of the pack. Moreover, the pressure will be upon one place instead of being distributed between two or three places, and case-bruising is likely to be the result.

Other aspects of the subject we have again to hold over for another month.

Vineyard Notes for June.

H. E. LAFFER, Viticultural Expert.

PRUNING and ploughing will now be in full swing, and they may be considered the two most important operations of the year. Upon them the future welfare and yields from the vineyards depend. Too often vines are pruned with a view to the succeeding crop only. This is a grave mistake, for a man who understands anything of the principles of pruning will always look one or two years ahead.

In many cases, too little attention is paid to the minor details of the work. Instead of looking upon a vine as something to be cared for in such a manner as to retain its vigour and powers of production at a maximum for a long period, it is chopped and hacked about by a so-called pruner whose one object is to treat the greatest possible number per day. This is the great fault of contract pruning, as it leaves no inducement for the workman to show his skill in any way but the rapidity with which he can work.

Each vine is an individual with certain latent possibilities, and care, as well as skill, is needed to develop and maintain those possibilities to their fullest extent.

The points to be borne in mind are, firstly, the selection of wood for the purpose of ensuring the coming season's crop, as well as to maintain vigour of growth and provide strong wood for the following year. This involves the selection of suitable fruit-bearing wood, which may be either in the form of rods or spurs, according to the fruiting habit of the vine. Supplementary to this, there should be special attention given to the maintenance or improvement of the shape of the vine by leaving special spurs or buds with that object in view. It should be remembered that a well shaped and balanced vine is cheaper to prune than a badly-shaped specimen. The best gauge of vigour in a vine is the strength of the general growth made during the past year. According to this, an experienced pruner may increase or decrease the numbers of spurs or rods, having in view always any purely local factors that may have affected it temporarily one way or another.

The second important point is the complete removal of wood which is not needed. Frequently such growths are more or less roughly removed, with no attempt to get rid of the accumulation of imperfect buds situated close to the base. This practice results in large numbers of weak growths developing, which have ultimately to be removed by "summer pruning." Failing such treatment, they remain to crowd the vine, weaken the fruit-bearing wood, and increase the cost of pruning in the following year. It takes no more time to cut away a cane below its base buds, and in every way it is an advantage. The growing of these useless shoots can be compared to choking a growing crop with weeds.

The too great multiplication of arms in an old vine should be guarded against. So soon as a secondary arm becomes so long and scarred that the growth at its summit is abnormally weak, it is time for its renewal.

The renovation of these old, but otherwise sound vines can, with advantage, be secured by proper treatment. Any given vine may be regarded as capable of carrying a certain weight of fruit, and the greater the number of bunches into which that weight is split up the smaller the size of each. Thus we have a greater number of bunches to handle in picking, with correspondingly increased cost. It is far better to have that weight in fewer bunches, for the quality will then be better and the handling cheaper.

Remove a percentage of the old worn-out arms, and throw more vigour into the remainder, thereby producing better quality fruit of the same weight with less cost in picking. If the vines have gone so far as to be almost beyond recovery, reduce the number of secondary arms considerably, and it will most likely be surprising to see the amount of young growth forced out. Assist such plants with some form of manure as a stimulant, in accordance with the suggestions made in the article on manuring in the *Agricultural Gazette*, July, 1918.

A FRUITFUL CHINA PEAR TREE.

MR. J. J. POPE, of Martinsville, forwards an illustration (reproduced below) of a China pear tree which grows on the edge of his orchard, on heavy black soil, at Martinsville. The tree is about twenty years old, and when photographed a few weeks ago carried 25 bushels of fruit. Two years ago 40 bushels were pulled from the same tree, while last year the crop was only 9 bushels, the lightest for eleven years.

For the whole of this period it has not been cultivated, but has been allowed to grow under the sod-mulch system. Paspalum grass grows well up to the tree ; this is cut two or three times a year and allowed to decay.

This, with a spraying of red oil in winter, and the spring spraying of arsenate of lead, is the only attention the tree has received.

There are no other pear trees near.

Poultry Notes.

JUNE.

JAMES HADLINGTON, Poultry Expert.

IN last month's notes the average seasonal expectation of laying was dealt with, and some of the causes for poor results stated. The figures quoted indicate that a decided improvement should take place during May, when roughly we should expect about one-third more eggs from forward pullets than for April. It is doubtful, however, if the average expectations of laying have been realised during May. The fact is that, apart altogether from the known causes mentioned, there appears to be an almost general backwardness among the pullets expected to be coming on to lay that can only be attributed to seasonal conditions. The lack of a plentiful supply of green feed in many parts is in some cases blamed for this backwardness; but many flocks have come under notice where this was certainly not the cause, from the fact that there had been no shortage on these farms.

One of the results of this backwardness, and a very important one, will be that it will accentuate the difficulty, always experienced to a greater or less extent in June and July, of securing sufficient eggs to make a start with the hatching. Nevertheless the points made in this regard last month hold good, that no effort should be spared to make an early start.

Artificial versus Natural Incubation.

Whatever may be charged against artificial hatching by the small poultry-keeper who has only a small number of birds to replace each year, there is no question as to its utility and necessity to the poultry-farmer, to whom early-hatched chickens are of vital importance; if the latter with his thousand or more chickens to hatch out annually had to depend upon hens to incubate them, he would invariably finish up with too many late ones. Nevertheless there are cases in which available broody hens might be used to advantage even on a poultry-farm where big numbers are kept. It should be remembered that a broody hen will often hatch eggs that will fail to hatch in an incubator, as, for instance, stale eggs, or eggs of low "hatchability" from other causes; in either case a very much larger percentage of eggs will hatch out strong chickens if the eggs have been set the first half of the incubating period under hens. This hint has special reference to special pens, from which a breeder might be anxious to secure some result, and which, if the eggs were put under artificial incubation, might fail to hatch.

Artificial incubation was fully dealt with in these notes for June of last year, and can be referred to by those having files of them. New readers will find this matter fully dealt with in the third edition of "Poultry Farming in New South Wales," obtainable from the Government Printer, Phillip-street, Sydney, 1s., or post free, 1s. 1½d.

Looking Ahead.

By this time the breeding pens should be in sight, and it should be possible to estimate the number of chickens that it is intended to hatch during the season, and to make preparations in advance to receive them.

One of the cardinal mistakes made by many poultry-farmers is, that they hatch all the chickens they can, instead of the number they can properly accommodate. This leads to an enormous wastage in chickens, and what is still worse, failure to secure proper development, which means a large percentage of unprofitable stock.

Necessary Equipment.

Many poultry-farmers have a measure of success with nothing but improvised equipment, and under conditions that could not be considered entirely satisfactory from a commercial outlook ; but in such cases it is at the expense of long hours and unremitting care and attention, such as lead many to ultimately abandon poultry-farming altogether after years of toil and hardship. There are other beginners who, perhaps, have the necessary capital to install good equipment but fail to do so for the want of knowledge of requirements. Many of this class, having started wrong, soon tire of the life and they are lost to the industry. The importance, then, of knowing requirements at the outset becomes obvious. Presuming 1,000 chickens are to be hatched annually, the following breeding stock and equipment would be necessary to bring chickens up to, say, the twelve-weeks-old stage :—

A section of five or six breeding pens to accommodate fifty to sixty birds.

Incubator capacity for 500 to 600 eggs.

Incubator room : size according to class of incubator to be installed.

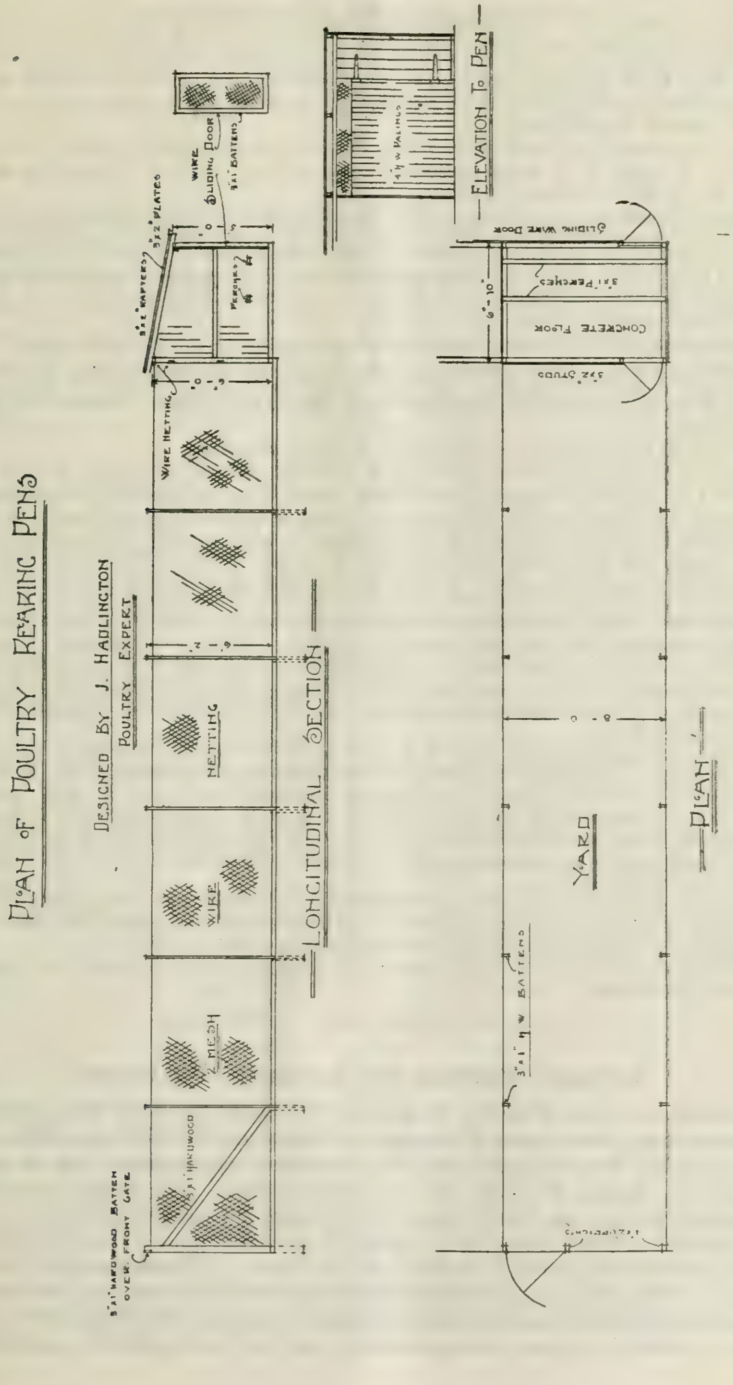
One brooder house containing eight brooders of a capacity of 800 baby chickens, which means an average capacity of about 400 chickens of varying ages up to six weeks.

A section of eight rearing pens of a capacity of, say, 400 chickens up to twelve weeks old.

From that age practically adult accommodation is necessary. For details as to how chickens are handled right through, readers are referred to the publication quoted above.

Rearing Pens.

On many farms the equipment for rearing chickens up to five or six weeks of age is more or less complete, or of a nature that at any rate ensures a measure of success. But the stage that is most conspicuous by its absence is suitable accommodation for the chickens after they leave the brooders at the age mentioned. For want of suitable accommodation at this stage great losses or checks in growth occur. With a view to meeting this requirement, the accompanying plan and specifications for suitable accommodation for this stage are presented. If this building is equipped with the contrivances for roosting as shown in these notes for last December, it will be found to meet the requirements between the ages of six and twelve weeks.



Plan of Poultry Rearing Pens

Designed by J. Hadlington, Poultry Expert

SPECIFICATIONS OF POULTRY REARING PENS.

The rearing pens to consist of a yard and roost of the sizes shown :—

Walls.—The walls are to be constructed with 3 in. x 2 in. H.W. studs tenoned into 3 in. x 2 in. Oregon top and 3 in. x 2 in. H.W. bottom plates. Line over studs externally with sawn H.W. palings on the lap-and-space principle, and partition wall with similar palings butt jointed, nailed at top and bottom to plates and at centre to 3 in. x 1 in. H.W. battens let into studs.

On the elevation showing to yard trim for wire-netting panel as shown, and cover with 2 in. mesh x 18 gauge galvanized wire netting secured to top plate and to 3 in. x 1 in. H.W. batten at bottom.

Roof.—Construct roof as shown with 3 in. x 2 in. H.W. rafters, spaced 4 ft. centres ; notched over and spiked to plates. Cover with 26 gauge galvanized corrugated iron, secured with 1¾ in. galvanized screws and lead washers to 3 in. x 1¼ in. Oregon battens. Put 4 in. galvanized quarter-round gutters to eaves on galvanized brackets, and 2½ in. x 24 gauge galvanized down-pipes at each end of building. Ends of building to have a roll formed on edge of iron.

Floor.—Lay floor in house with 1½ in. of concrete mixed in the proportion of one of Portland cement (Colonial manufacture) to six of creek shingle or ashes, with sand as required. Render the top ⅜ in. thick with cement in the proportion of one of cement to three of sharp sand, finishing flush with top of bottom wall plates. All should be laid in one operation.

NOTE.—If ashes are used, top dressing will not be necessary.

Doors.—Construct plain ledge doors 2 ft. wide by the full height of walls with 6 in. x 1 in. T. and G. ledges, brace, and 6 in. x ¾ in. T. and G. sheeting, hung with 14 in. japanned tee hinges to 3 in. x 2 in. studs. Gates and doors to be fastened with No. 6 galvanized fencing wire through studs, turned and hooked at ends. Fit up with sliding door where indicated, made with 3 in. x 1 in. Oregon frame covered with 1 in. mesh galvanized wire netting. Door to slide between top plate and a piece of 3 in x 1 in. Oregon nailed to top and bottom plates for a guide. Fit up with 3 in. x 1 in. H.W. perches where shown, the top edges slightly rounded off and the ends resting on 1¼ in. x 16 gauge galvanized-iron brackets nailed to walls. Perches to be spaced 10 in. and 2 ft. 9 in. respectively from back to centre of same and to stand 12 in. above floor.

Feed Trough.—To each roost, and the full width of same, provide and set in brackets one length of 4 in. O.G. galvanized eaves gutter. The ends to be closed up, and to stand 4 in. clear of floor.

Yards.—Construct yards with 3 in. x 1 in. H.W. vertical battens set on edge to wire netting. Let 20 in. into ground, with an additional piece of 3 in. x 1 in. H.W. 2 ft. long nailed to bottom of same. Posts at ends of pens to be 4 in. x 2 in. H.W. let 24 in. into ground, every second braced with 3 in. x 1 in. H.W. braces as shown. Over gates, also, to be braced with similar braces. Enclose the whole of yards with 72 in. x 2 in. x 17 gauge galvanized wire netting, secured to uprights and to 3 in. x 1 in. H.W. battens at bottom all round yards.

Gates.—To each yard provide a gate constructed with 3 in. x 1 in. Oregon styles, brace and rails, and 2 in. x ¾ in. Oregon vertical battens spaced 1¾ in. apart, hung with 14 in. japanned tee hinges to gate posts, and fastened as specified for doors.

Bottom plates of house to be supported with a brick under each corner and under the centre of each wall.

CURING PRUNES IN ADVERSE WEATHER.

ACCORDING to the Monthly Bulletin of the California State Commission of Horticulture, heavy rains in September of last year in California, followed by a long period of warm moist weather, threatened an enormous loss of prunes that were being dried by the open-air method. The usual methods of handling wet prunes failed because of the adverse weather conditions setting up moulds and ferments, but a number of growers found it possible to dry the fruit by first subjecting it on the trays to fumes of burning sulphur for two hours. This thoroughly checked moulding and fermentation, and made it possible to finish the cure of the fruit satisfactorily. The sulphured product was excellent in flavour and appearance, and has been profitably marketed.

Orchard Notes.

JUNE.

W. J. ALLEN and W. LE GAY BRERETON.

Pruning.

PRUNING will be the operation mainly engaging the attention of deciduous fruitgrowers during this month. To economise time, stone fruits, such as Japanese plums, apricots, and peaches, which make an early start in the spring, should be dealt with first, leaving the later starting trees, such as pears and apples, till afterwards. Young trees for the first few years require to be cut back rather hard. This not only prevents them from extending their main limbs too rapidly, with the liability of their being broken out by bearing on the ends, but also ensures sufficient eyes to make strong shoots, from which can be chosen, during the following spring and summer, the future leaders. Many varieties are liable to grow too upright, and it is a good policy to cut to a bud above the outside bud. The growth then from the top bud will cause the outside bud to grow out at a wider angle. When this system is adopted it is necessary to check the growth from the top bud during the following spring and summer, otherwise there is a likelihood of the top bud getting ahead of and sapping the shoot from the lower outside bud, which is the one that is required.

This spring and summer operation is necessary with young trees in any case, however, and is therefore no drawback to the system. The piece of wood with the checked shoot above the desired leader is removed the following winter.

Where numerous leaders have been thrown out during the previous growing period, they should be thinned out. In young trees more are retained than in fully formed trees, as they are required to multiply the main branches. In the older trees the full number of main branches has been attained, and only one leader is mostly required to each main branch. When choosing the leaders to be retained on upright growing trees, every opportunity should be taken to open out the head. But do not fall into the error, made by some, that opening up the centre means cutting away all growth from the lower parts of the limbs. An open centre means that no main limbs are growing up through the centre; but the object of such a form of tree is to induce and maintain the growth of laterals, carrying spurs or fruit buds, or spurs direct along the main branches of the tree.

When trees on good deep soil have their main framework well established and the limbs are stout, and if they are still making numerous and vigorous leaders, it is a good plan to thin the leaders out, but not to top them back for a season or two. This steadies their growth and lessens the work of pruning the following year, and will often throw a tree into bearing.

A pruner should observe the results of the previous season's work on all varieties of all classes of trees. He will then learn their particular habits and how they respond to the treatment given them.

The bearing habits of the different classes of fruit trees should be borne in mind, and in that connection the following may be useful:—

Peaches and Nectarines.—These bear chiefly on wood produced the previous season, and where there is sufficient of this class of lateral one can cut out the older laterals, thus encouraging growth of a fresh lot during the next growing season, and providing fruiting wood for the season following that again. But where these trees have not made sufficient new laterals direct from the main limbs during the previous growing season, some young lateral or temporary spurs that have shot from the two-year laterals must be left to allow for sufficient blossoming. The general rule, however, with these trees, is to cut out the two-year-old laterals and leave sufficient of the yearling laterals. In light croppers, only cut back the yearling laterals slightly, or do not shorten them at all. With heavy croppers, which show their fruit buds close to the base of laterals, shorten the yearling laterals hard.

Japanese Plum.—Japanese plums will crop on the yearling laterals, but also develop permanent spurs on the older wood. Hence there is not the necessity for annual renewal as in the peach. However, the spurs along old laterals become spent; and any laterals carrying spurs showing this tendency should be shortened hard back or cut out, so that a new spur will develop or a new lateral appear, which will develop a new set of spurs. The Japanese plum responds to this treatment very readily.

European Plums and Prunes.—The European plum does not as a rule often bear on the yearling lateral, but chiefly on spurs either direct on the main branches or on the older laterals. These require thinning and renewing as described for the Japanese plum. In some varieties, such as Prune d'Agen, the yearling lateral should be left a good length to induce it to develop spurs. Other varieties may have the laterals shortened fairly hard, and they will still furnish up with spurs.

Apricots.—These are not unlike Japanese plums in that they bear on yearling laterals, and on spurs growing direct from the main limbs or from two-year-old laterals, but their spurs are not very lasting, and require renewing or invigorating frequently by shortening back the laterals which carry them.

Apples and Pears bear chiefly from spurs on two-year-old wood or older. Some varieties require the yearling laterals to be left a good length to induce them to develop spurs. The spurs also in some varieties multiply rapidly and become very weak if not thinned out. Old laterals carrying spurs should be shortened back in order to keep the remaining spurs in vigour.

Orchard Burners.

A working plan converting an old square tank into an orchard burner was published in the *Agricultural Gazette* for April. Burning off the prunings in a portable burner is by far the cheapest way of getting rid of them. If the fire is poked down with a light sapling now and again to prevent it burning hollow, it is surprising how quickly it will consume them. This method has also the advantage of burning up on the spot any prunings carrying scale or other pests or fungus diseases, instead of them being carted along the rows and possibly communicated to healthy trees. On a frosty morning, when it is painful to the hands to prune, one can be comfortably and usefully employed for an hour or two burning off the previous days' prunings. There is no doubt that growers of deciduous fruit would find the burner a most useful acquisition.

Planting.

If the ground is in good order, planting of young trees can be proceeded with. Directions have been frequently given in these orchard notes in previous years how to carry out this work. The planter should not forget, however, to cut the young trees well back after planting. Directions were given for the lay-out of an orchard in the *Agricultural Gazette* for June, 1917.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1919.

Society.	Secretary.	Date.
Parkes P., A., and H. Association	G. W. Seaborn	Aug. 20, 21
Forbes P., A., and H. Association	E. A. Austen	,, 26, 27
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 26, 27, 28
Cootamundra A., P., H., and I. Association	N. Gardner	Sept. 2, 3
Corowa P., A., and H. Society	J. D. Fraser	,, 2, 3
Narandera P. and A. Association	J. Faulkner	,, 9, 10.
Albury and Border P., A., and H. Society	F. J. Belbridge	,, 9, 10, 11
Young P. and A. Association	T. A. Tester	,, 9, 10, 11
Manildra P. and A. Association	A. Anderson	,, 10
Northern A. Association (Singleton)	J. T. McMahon	,, 10, 11, 12
Culcairn P., A., H., and I. Society	J. B. Ryan	,, 16, 17
Ganmain A. and P. Association	T. S. Henderson	,, 16, 17
Temora P., A., H., and I. Association	A. W. Ness	,, 16, 17, 18
Canowindra P., A., and H. Association	H. M. Brown	,, 23, 24
Murrumburrah P., A., and I. Association	W. Worner	,, 23, 24
Holbrook P., A., and H. Society	J. S. Stewart	,, 30, Oct. 1
Deniliquin P. and A. Society	P. Fagan	Oct. 1
Hay P. and A. Association	C. L. Lincolne	,, 15, 16
Orange A. and P. Association	W. J. I. Nancarrow	,, 15, 16

1920.

Society.	Secretary.	Date.
Kiama A. Society	G. A. Somerville	Jan. 24, 26.
Southern New England P. and A. Association (Uralla)	H. W. Vincent	Feb. 24, 25. 26
Armidale and N.E. P., A., and H. Association	A. McArthur	Mar. 16, 17, 18, and 19.

Agricultural Bureau of New South Wales.

Suggested Subjects for Bureau Meetings.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion:—

What grain are you in the habit of feeding to your working horses? In districts where maize is generally used, the scarcity and high prices of the past few months have necessitated the use of some other grain; have you had any experience with wheat as a substitute? Have you tried steaming, or steeping, or crushing the wheat to make it more suitable for the purpose; if so, with what results?

To what extent do you think colour influences the value of a cow? White cows are sometimes objected to on the ground that they are not good butter producers; black cows on the ground that they are not good butchers' cows; and light-coloured animals generally on the ground that they lack hardiness and constitution. Discuss these three objections in the light of your own experience. One white cow in a well-known pure-bred herd lately gave over 800 lb. of butter in a year.

In many cases the date of planting has had a material effect upon the maize crop this season. Have your results depended in any measure upon that, or has variety or cultivation seemed to you more important? Some crops have yielded indifferently because of faulty germination; do you consider this has affected your own yields?

Does your experience suggest that disease may be spread in the orchard by failure to destroy the prunings promptly? Have you ever noticed anything that suggested that scale insects, for instance, have been spread in that way? What method do you adopt of destroying the prunings, and with what results?

What month do you advocate for commencing the hatching of chickens in your district? Why do you prefer that month, and do you think any other month would produce better layers?

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Albury.

A fruit show was held on 9th and 10th April, under the auspices of the Albury branch of the Bureau, a large and most attractive collection being obtained for the purpose, notwithstanding the inconveniences and a postponement necessitated by the influenza restrictions. The entries were so numerous that in some of the classes (such as that for Jonathan apples) the prize-winners had to be picked from twenty exhibits. Apples, pears, quinces, persimmons, grapes, dried fruits, potatoes, vegetables, fodder plants, tobacco, &c., were all represented, and by exhibits of excellent quality. The exhibition, which attracted large attendances of the public, was opened by Mr. F. J. Belbridge, who congratulated the promoters on a very successful venture, regarding it as an excellent advertisement of the resources of the district.

Bankstown.

A meeting of this branch was held on 24th March, when Mr. J. W. Cunningham read an interesting paper, urging that the planting of trees and the growth of flowers should receive more attention, the more so as it would in a few years be an important suburb.

Bimbaya.

At the monthly meeting of this branch, on 16th April, the question was discussed, "Should the bull be allowed to run at large with the dairy herd?" Nearly all present took part, and it was agreed that the bull should be separately paddocked on every farm. The herd could then be properly regulated, the bull cared for, and the spread of disease controlled.

Cotta Walla.

A meeting of this branch was held on 14th April, when two papers were read, namely, "When to Breed the Heifer," by Mr. C. W. Howard, and "Superphosphate," by Mr. J. J. Wray. Both were interesting papers. The first was, briefly, as follows:—

WHEN TO BREED THE HEIFER.

Much data has been collected on the question of the age at which the first calving should take place, but so much depends on the breed, the size of strain or family, the character of the feeds and pastures, weather conditions, and so forth, that it is impossible to be arbitrary.

Information that has been collected from different farms and herds, and experiments that have been conducted in the Dominion of Canada, have demonstrated two things:—(1) Heifers well reared by good feeding reach mature weight and production much sooner than if less generously fed while young; (2) good rearing will result in a cow weighing from 300 lb. to 500 lb. more than a poorly reared animal, the increase in weight representing greater frame and muscle—in other words, a stronger, more durable machine, of greater capacity for milk production. If it is found profitable to force the calves to a good size at an early age by good feeding, then the heifer may be bred at 17 to 20 months old. Where weather and feed conditions warrant slower growth and maturity, heifers should not be bred till 24 to 27 months old. Even then they should be sufficiently well nourished to reach a good size before breeding.

The well-grown heifer that is bred to calve first between 26 and 30 months old should produce well from the start, and will reach mature weight and production at 5 to 6 years of age. The slower-grown heifer bred to calve first between 30 and 36 months old may, if properly handled, reach the same mature weight and production as the other cow, but a little later. The poorly-grown heifer, bred to calve first at under 30 months old, will probably continue to increase in weight and production till 7 years of age, but will never reach the desired size, nor be as profitable, as those better handled. The foregoing ages make allowance for different breeds, the smaller and less hardy breeds requiring to be bred at the later ages.

Within reasonable limits, the inherited tendency to production of milk is a greater factor than the size of the cow. At the same time, the larger cows, as a rule, produce most milk, and are undoubtedly capable of manufacturing larger amounts of rough forage into milk, and with increased profit. Heifers that calve young—under 24 months—are undoubtedly led to develop dairy qualities very young; but there is a strong tendency to greatly reduce the size and constitution, and thus to lessen the capacity for consumption of feed and production of milk. Well-grown heifers that calve at the age of 26 to 30 months, or even somewhat slow-growing heifers that calve at 30 to 36 months old, will not acquire the same degree of dairy refinement until a year later than the foregoing class; but even so, will produce more heavily.

Cunningham.

The Fruit Expert and Irrigationist of the Department, Mr. W. J. Allen, visited the district on 1st April, and gave a representative gathering advice concerning irrigation matters. He showed clearly how it was possible, with a small outlay, for the farmer on rising ground to conserve water to a limited extent. A number of members who have their holdings on the flats and running creeks, were greatly interested, and several announced their intention to put Mr. Allen's advice into a practical form in the near future.

The monthly meeting was held on 11th April, when a paper on co-operation was read by Mr. A. C. Wilson. It proved very instructive to those present, and caused considerable discussion. All members were keenly interested, and fully alive to the fact that co-operation must play an important part in the future welfare of the man on the land.

The branch on the 14th April tendered a farewell and presentation to Mr. H. C. Stening, late Inspector of Agriculture for the district, who has been promoted to the position of Manager at Temora Experiment Farm. Very appreciative references were made to Mr. Stening's work and to the influence he had had on farm methods generally.

Eulomogo.

A branch has been formed at this centre. At a meeting on 7th April Mr. T. H. Mathews read a short paper suggesting that the subject of a district exhibit at the next Dubbo show should be taken up. The hope was that sufficient interest would be created in the matter to lead to several other district exhibits being arranged, and a competition being commenced that, besides being of much local value, would contribute to the exhibit of western districts at the Royal Show in Sydney. It was agreed to ask the Talbragar Shire Council and the Dubbo P., A., and H. Association to take the matter up.

Arrangements are in hand for obtaining boxes of books on loan from the Public Library, Sydney, for circulation among members.

The first office-bearers of this new branch are:—Chairman, Mr. J. A. Crowley; Vice-Chairman, Mr. G. F. Mills; Hon. Secretary and Treasurer, Mr. J. H. Stinson.

Inverell.

The monthly meeting was held on 11th April, Mr. G. H. Arkinstall presiding. The principal business was a paper by Mr. J. Ditzell, embodying a series of suggestions arising out of the very dry conditions of the past summer. A condensation of Mr. Ditzell's suggestions follows.

Lessons of the Drought.

The average annual rainfall during the last six years has been 2,984 points. For the first three months of the present year 650 points have been recorded, but the distribution has been so erratic that the benefits have not been commensurate with the falls. First among the lessons of the drought I place the cultivation methods that obtain the best results from the land. Farmers and dairymen in the Inverell district are favourably circumstanced regarding the quality of the land they hold, and should invariably be in a position to sustain their stock on their holdings, and not have recourse to outside markets for supplies of fodder at a time like this. Lucerne does well on all alluvial land, and no dairyman should have less than 10 acres of this valuable fodder plant in full bearing, and during the periods of beneficial rainfall he should carefully conserve every pound of it, in the form of hay, to be used at a time like the present.

Another proposition that is worth considering is making silage. Thousands of tons of good material go to waste during the wet periods, which, if saved as silage, would be a great boon in drought time. Overstocking, too, has a detrimental effect on pastures; and it often occurs that a dairyman has so many stock on his place in a good season that he is practically always short of grass, and, falsely lured into the belief that similar favourable conditions will continue indefinitely, is caught napping when periods of real scarcity come along. I am aware that labour conditions militate greatly against making provision as pointed out, but do not the benefits derived compensate in the long run for the extra work?

Fallowing a portion of your land is to be recommended, and, I think, more especially during a wet summer. Take, for instance, the summers of 1916-17 and 1917-18. The first was abnormally wet during December, January and February, when a short and severe drought succeeded. In the second, the rain ceased at the end of January, since which, save a beneficial break in July and August last, the district has been in the throes of a drought. Now take the first period. Wheat sown on land that had been cropped with early maize did well, and the same remarks apply to the second season. The deduction to be drawn from this experience is that the maize land, receiving thorough tillage to keep down weeds, and ripening its crop early in the autumn, was in good heart, and also retained some of the moisture of the last rains of the summer. I cut 12 tons of hay from 7 acres and stripped 100 bags of wheat from 16 acres after taking the maize off in 1917-18, and last season, in spite of the adverse weather conditions, garnered 15 bushels of wheat per acre after the maize crop. Now if any farmer had fallowed only 20 acres of good land for wheat last season, he would, at the lowest calculation, if he cut for hay, have obtained at least 20 tons of material—poor in quality, perhaps, but estimate its value just now ! It is absolutely necessary to work the fallow to check weed growth.

In all probability some sort of co-operation would be a good thing. The machinery necessary to carry on farming operations could then be purchased co-operatively, and the groups so formed could assist one another. The machines they required would be an engine, chaffcutter, corn-thresher, and, I think, a small wheat-thresher. In the early days, when all wheat was hand-reaped, the straw was often saved, as well as the chaff, and during hard winters the working bullocks and dry stock did well on it. The wheat, if cut on the green side, produced a straw of fairly high feeding value, and in those times many a ton was cut up for chaff. In America great value is placed upon maize stalks, and it might be worth consideration by our farmers. A case of how cattle will consume dry and apparently useless maize stalks and variegated thistles came under my observation a few months ago. They did not leave a vestige, and seemed to do all right on the stuff. But how much better would that material have been if it had been properly conserved ?

Farmers should also combine to assist each other to minimise the labour problem, which is becoming serious, and will eventually have a disastrous effect on the whole primary industry. They should form groups of six or eight adjoining farms, buy a full plant between that number, and all work together.

DISCUSSION.—Mr. KOOK agreed with Mr. Ditzell as to the value of threshing of wheat in order to save the straw and chaff, instead of the combined harvester. The advantage gained by cutting with a binder and threshing would pay handsomely for the extra labour. He was a great believer in silage for stock, and thought the Government should advance money to the dairy-farmers for the purpose of erecting silos. These, under Mr. Ditzell's group system, could be easily filled.

Mr. FRIZELLE thought they should certainly endeavour to co-operate, as the labour problem was serious, and would not, as far as he could see, improve.

Mr. F. LIMBERG said in former times they used to thresh a lot of wheat and save the straw, and they never felt the dry seasons at all or a hard winter, as there was always an abundance of good quality straw. He considered the straw a great asset on any farm. It was cut for the thresher when green, and stacked, and was much better than a lot of chaff that was put on the market.

The CHAIRMAN thought the labour entailed in threshing wheat made it impossible, but for other farm work it was quite possible by the group system to save money and labour. There were several good points about co-operation, the main one being the disposal of the produce. In co-operation farmers need never fear a falling market, as they could fix their own price, and then there need be no rush to harvest. The produce should be all sold through their own selling agency. He also advocated fallowing, especially old paddocks ; one was certain at least to get some return from land properly fallowed.

Lidcombe.

A meeting of this branch was held on 10th March, when a paper was read by Mr. Cline, from which the following paragraphs are taken :—

ONION GROWING.

For some unaccountable reason onions seem rather neglected by the amateur gardener. This is strange, as only ordinary cultivation is necessary, and a good supply of onions could be grown for home use on a comparatively small plot of ground. Onions are indispensable to good cookery, and may be regarded as an article of real nourishment. They are also said to act as a stimulant to the stomach when eaten raw, and to promote a flow of the gastric juices. In some cases, however, with people who suffer from indigestion, raw onions produce unpleasant symptoms, though they seldom give trouble when cooked.

They are considered an excellent restorative; and in cases of restlessness a supper of cooked onions will often produce a night's sleep. By boiling they are deprived of much of their pungency; they are not considered so wholesome either fried or roasted, though the old time-honoured dish of fried steak and onions is not to be scoffed at.

Garlic, leeks, and shallots may be said to belong to the onion family. They all contain a principle called allyle, to which they owe their peculiar flavour.

Onions can be grown on various kinds of soils provided they are thoroughly prepared and fairly rich. Some people contend that they can be grown in very poor soil; but it will be found that the best and heaviest crops are produced from well worked, deep and rich loam. They are said to grow more rapidly on a light sandy soil, but the matured bulbs do not keep so well as those grown on heavier land.

June is the month generally recommended for sowing the seed for a general crop, but I rather favour the end of April, as the ground is then warmer and the seed germinates much better than when the soil is cold and wet.

At one time it was the general plan to sow the seed broadcast or in drills, and if the plants grew too thick then they were thinned out. Of late years, however, raising the seedlings in boxes or small beds and transplanting them to drills has almost generally been adopted, and much can be said in favour of the method. Weeding can then be carried out with greater facility, and the soil cultivated between the drills. In America, where onions are grown in vast quantities, this method is universally adopted. Experiments conducted at many places show that the transplanted bulbs gave a decided increase over those not transplanted.

There are several good varieties, such as Brown Spanish, Brown Globe, Market Model, Giant Rocca, &c. Giant Rocca grows to a large size, and, as far as my experience of them has gone, they seem very suitable to this locality.

The seed should be sown in seed-boxes or in seed-beds in the ordinary way, and lightly covered with fine mould that has been passed through a small mesh sieve to free it from stones and rubbish, and then pressed and made fairly firm. It is most essential to obtain fresh reliable seed, as onion seed loses its vitality very quickly. The young seedlings may be transplanted when the stems of the plants are about the thickness of a slate pencil. Previous to planting out, dig and work the soil thoroughly and deeply, bringing it to a fine tilth and leaving the surface as smooth and level as possible. In poor land manure should, of course, have been applied previous to digging. Poultry manure is considered excellent for onions, if applied judiciously. Sheep manure and pig manure are also said to be very suitable and to give good results.

It is an excellent plan, if the land is available and not taken up with other crops, to dig it up in the autumn and leave it to the fertilising effects of sun and air, until just previous to planting time.

In transplanting, lift the plants carefully by running the point of the trowel or an old table knife underneath the roots. Trim off part of the tops and the end of the roots; trimming or pruning the roots has some beneficial influence on the yield. One inch is considered about the right depth to plant. Plant the seedlings about 6 inches apart in the rows, and the rows 15 inches apart. While the crop is growing, the soil should be well stirred and kept free from weeds. The hand fork is very useful for stirring the soil between the drills in small gardens. The ground should not be cultivated too deeply, as some of the roots are close to the surface and deep cultivation would interfere with them.

The crop should be pulled as soon as the bulbs reach maturity. This is signified by the tops dying off and falling over. It is very essential that the onions should be pulled at this stage, for if left longer in the soil the onion sends out fresh roots and starts fresh growth of the stem inside the bulb. After pulling it is advisable to let the onions remain on the surface two or three days. We should be careful the onions are thoroughly dry before storing them. Where grown in large quantities they have large curing sheds; but small quantities grown for home use might be hung up in small bunches to the rafters of an outhouse, or better still, a piece of wire-netting might be suspended from the roof and the onions spread out close together but not actually touching. It is well to examine them frequently and remove any that may be going bad, and they should never be stored in large bulk for longer than a few days without an examination.

Of other types of onions, there are the potato onion or Multiplier (so called from growing in clusters) and the tree onion.

If a large bulb of the potato onion is planted, divisions occur during the season of growth, resulting in the formation of three to, perhaps, eight or ten bulbs. If small sets are planted they produce single large onions. It will be seen that if small sets are planted they increase in size, and if large sets they multiply. They grow something after the nature of a shallot, only that the shallot is small and always multiplies. They are mild and sweet in flavour, and are rarely attacked by onion maggot.

Tree onion is another variety. It is very hardy and grows well in cold climates. They produce tops and bottoms, small onion sets forming on top of the stalk. These top sets sown will produce bottoms only the following season, and these bottoms if planted will in turn produce both tops and bottoms the following season. The quality of the tree onion is considered inferior, though I have grown a few for many years, and rather like them for eating raw, as they are not so hot or pungent as the ordinary variety.

Diseases.—Although perhaps not as prone to diseases as many other vegetables, the onion is not immune from attack. It is attacked by the onion maggot, cutworm, thrips, smut, mildew, &c. The onion maggot is caused by a small fly depositing its eggs in the lower part of a young onion plant; the egg produces in about a week a small white grub which eats its way into the bulb. Strong lime-water made from freshly-burnt lime will kill all the maggots with which it comes in contact.

There is hardly a single one among market garden or ordinary farm crops that will pay better than onions. They will yield substantial profits under good treatment and suitable conditions. In some parts of Victoria farmers pay as high as £6 per acre rent for land to grow onions, and show handsome profits. It could be safely assumed that they could be grown more largely in New South Wales. The Hunter River and Wellington districts, and areas on some of the northern rivers, seem to be the only places where they are grown to any great extent.

DEPARTMENTAL NOTE.—Mr. A. H. E. McDonald, Chief Inspector of Agriculture, states that onions are not universally transplanted in America. Transplanting is followed only in the Southern States and to a limited extent. The application of lime to the soil prevents injury from onion maggot to some extent. Rotation of crops and the drawing of the earth around the bulbs are also recommended.

Lisarow.

The secretary of this branch has furnished the following report with regard to trials of Sudan grass and Napier's Fodder grass in the district.

TRIALS OF SUDAN GRASS AND NAPIER'S FODDER GRASS.

A trial with Sudan grass and Napier's Fodder grass, grown in comparison with Planter's Friend to determine which was the most suitable fodder for this district, was carried out at Lisarow (near Gosford) by Mr. A. L. Kelman.

The seed of Sudan grass and Planter's Friend was sown in shallow drills, spaced about 3 feet apart, opened with the plough, and lightly manured with superphosphate at the end of September, 1918. Five cuttings of Napier's Fodder grass were planted in similar soil close by, spaced 3 feet apart, and also lightly manured with superphosphate.

The ground was in good order when planted, containing plenty of moisture, and both Planter's Friend and Sudan grass germinated well, the latter coming through very quickly. From the time of planting the weather set in very dry; the season was considered locally the driest for about thirty years, no rain of any consequence falling till the end of February. In spite of this, however, the Sudan grass grew rapidly, easily outgrowing the Planter's Friend and Napier's Fodder grass, and up to the time of writing (1st April) five cuttings have been taken off, with a chance of another yet before frosts set in. The drills of the Sudan grass were scarified after each cutting and the Planter's Friend until it became too tall.

Sudan grass is easily the quickest growing fodder I have yet come across, and for this district, in a dry season at any rate, I consider it much superior to Planter's Friend. The latter, at 1st April, is only about 6 or 7 feet high and is just ripening seed, having been badly checked by the continuous dry weather.

I have fed the Sudan grass to horses and cattle, and both eat it readily, and I find if sown fairly thickly in the drills that it does not become coarse; even when 6 feet high the stoutest stalks are no thicker than an ordinary lead pencil.

Napier's Fodder grass seems to require a moist season for its full development, for it grew very slowly until the February rains, and at 1st April is about 6 feet high. Though carrying plenty of leaf it seems very hard in the stalk, and would, I think, require chaffing before being fed to stock.

Miller's Forest.

At the last monthly meeting of the above branch, Mr. Thomas Leslie read a very interesting paper.

CAN DAIRYING AND AGRICULTURE BE COMBINED ON SMALL AREAS?

Mr. Leslie took as his "small farm" an area of 20 acres, which, he said, was a mere stockyard to some farmers, but in the fertile valley of the Lower Hunter, with its deep water frontage and close proximity to Newcastle and Maitland, was sufficient to provide a good living for a small family. At the same time he took the view that, for dairying and agriculture combined, it was too small, and dairying alone would be more profitable all the year round. The prospects of the manufacture of dried milk and milk powders becoming important industries (as they already were in New Zealand) encouraged him to look favourably upon dairying, provided crops were grown that could be fed off. Much labour would be saved, in that the cows would harvest the crops themselves, and both the manure and the plant remainders would be ploughed in. The growing of millet, or maize, or potatoes, was profitable in a good season, but it involved much labour and the risk of no return at all, whereas dairying would bring in a steady return. In these ways agriculture and dairying could be combined profitably.

Moss Vale.

On 26th March, Mr. J. W. Mathews, Sheep and Wool Expert, gave a lecture of practical value on wool-growing and sheep-breeding at the showground. Several members of the branch took various breeds and types of sheep to the show ground as examples for the lecturer to speak on.

SHEEP IN COASTAL DISTRICTS.

Mr. Mathews said that though Moss Vale was not essentially a sheep district, there was no reason why sheep-breeding could not be successfully carried on; in fact, the time would come when millions of sheep, of the coarser breeds, would be raised in the coastal districts from Monaro to the Clarence. The two essentials were the right sheep and right feed. As Merino sheep were most suited to the western districts, so the Romney Marsh sheep were most suited to local conditions. He advised the sheep-breeders of the district to have a policy of breeding and to stick to it—to avoid chopping and changing about by trying one breed one year and another the next. Having selected the right breed, the next thing necessary was a proper system of management, and then the proper and abundant food supply. Concentration on breed was one of the secrets of success. Dipping was recommended as a preventive of external parasites. Internal parasites were more numerous and important. Some advice was given about the symptoms and treatment of fluke, worms, &c. Drenching and good feed were recommended as important, and a liberal supply of salt should always be available. He suggested the growing of green feed to supplement the natural pastures, and was very emphatic on the fattening qualities of rape.

The demonstration in the afternoon was followed at night by a lantern lecture, which was well attended. The pictures were very attractive, and the lecturer's remarks were very instructive and thoroughly enjoyed by the members of the branch and their friends.

Spencer.

The regular monthly meeting of this branch was held on 19th April, when office bearers were elected for the ensuing year as follows:—Chairman, Mr. E. C. Allen; Vice-Chairmen, Messrs. J. Bushell and A. H. Woodbury; Hon. Secretary and Treasurer, Mr. H. J. Woodbury.

The business of the evening was confined to a discussion regarding the proposed standard regulations for packing and grading of fruit.

Springside.

This branch met on 28th March, there being a good attendance. The secretary reported that all the varieties of wheat and oats grown on the experiment plots had yielded well. Cleveland gave the best return among the wheats, with Marshall's No. 3 and Rymer next in order; Federation and Yandilla King were also sown. Of the oats, Algerian and Lachlan did best, the others being Guyra, White Tartarian and Sunrise.

Mr. A. J. Selwood read a paper, from which the following paragraphs are taken:—

THE CULTIVATION OF PEAS.

Peas can be grown successfully in this district in spring, summer and autumn. South and south-east slopes are the most suitable. Plough deep for the summer crop, work the soil down to a very fine tilth, sow after rain if possible, but under dry conditions plant deep enough to meet the moisture. I had the best results this season from seed that was sown at a depth of 6 inches; but in wet seasons it is not advisable to sow deeply, as a great supply of moisture is not necessary. There would be more loss from too much moisture than from dry weather. Peas sown for the summer crop mature much more quickly than those sown for the spring and autumn, the summer crop taking from 9 to 12 weeks, the autumn 12 to 16 weeks, and the spring crop anything from 16 to 20 weeks. The seed should be procured from reliable seedsmen. Never buy cheap seed. Yorkshire Hero for the summer crop is the best variety, being a heavy yielder. The harvest extends over a long period if the pickers are careful, as many as four pickings being available from the one crop under good treatment. Senator is the best for the autumn; it is a heavy cropper, pods very long and well filled, but light in colour. In a fair season can be grown and harvested well as late as June, which cannot be done with any other variety. Sherwood for the spring crop, sown in May, will go right through the winter without blooming. Sow in drills east to west for spring and autumn; north to south is preferable for the summer crop.

Drills should be from 2½ to 3 feet apart. I prefer the 3 feet space in strong ground, so that the vines shall not become tangled. Tangled vines are difficult to pick and have to be torn apart, which means that a lot are damaged that would come in for future pickings. I prefer the plough for sowing, opening a furrow from 8 to 12 inches wide, scattering the seed evenly over the full width of furrow, and sowing from 1 to 1½ bushels to the acre.

Three crops in the same ground is enough, as it then becomes pea-sick. Follow with a straw crop, which will put it in good condition for peas again. I have sown potatoes after a pea crop with splendid results. About harvest time watch the crop closely, and when the pods have filled nicely and are still green, and the seeds tender, they should be picked. Do not wait until you think you have enough for a good load. If you do, a couple of pickings is all you will get, and also a low price in the market. If the pods are harvested when the first pods are fit, you will always get top market price, and it will be more satisfactory to your agent and yourself.

Crops this season have been almost a failure owing to droughty conditions prevailing, but prices have been exceptional, ranging from 12s. to 20s. per bushel. From my experience, covering three years of pea growing, prices have averaged from 5s. to 8s. per bushel.

It is a good line for anyone starting a young orchard to sow peas between the trees, and, when the picking is finished, turn the vines in before they get dry. They add wonderfully to the profits of the orchard.

Stratford.

A meeting of this branch was held on 15th March, when four new members were enrolled. Mr. T. Germon read a paper on hatching and rearing of chickens, and members had a lengthy discussion following same. Members have availed themselves of the loan of books on agricultural subjects from the Public Library, Sydney.

At a meeting on 19th April, after disposing of the formal business, Mr. C. L. Yates gave a milk testing demonstration. This was the first demonstration of the kind ever given in the locality, and very keen interest was taken by members in the proceedings. Six members submitted samples of milk to be tested, and after seeing the results several decided to purchase testing outfits and to commence immediately culling their herds. One member has offered the free use of his testing apparatus for a term of three months.

Tallawang.

The annual meeting of this branch was held on 30th April. The secretary outlined the activities of the branch during the past year and made an urgent appeal for greater support from farmers in the district. The balance-sheet showed a credit of £1 17s. 6d. Three new members were enrolled. Mr. Arthur Robinson was elected Chairman for the ensuing year, and Mr. S. E. Hinder was re-elected Hon. Secretary.

Thyra-Bunaloo.

At the monthly meeting on 12th April a discussion took place with regard to the quantity of wheat sown per acre in the district. Mr. Cheatley, a recent arrival from northern Victoria, stated that in that part farmers used 60 lb. per acre for April sowing, and for the month of May 70 lb. per acre was used. However, since his removal to the Bunaloo district he was using 60 lb. per acre of Federation and 70 lb. per acre of Yandilla King. Mr. R. Adams said he got the best results by using from 60 lb. to 65 lb. of Federation per acre. Mr. E. J. Beer recalled that years ago excellent results were obtained by sowing 30 lb. to the acre, but the custom now seemed to be to give a much heavier sowing. Mr. E. J. Berriman was satisfied that 60 lb. of Federation per acre gave good results.

DEPARTMENTAL NOTE.—The Under Secretary and Director remarks that these sowings are very heavy, and some farmers in the district might try less on small plots. Yandilla King should be sown before Federation and appreciably lighter.

Toronto.

The monthly meeting of this branch was held on 1st April. The balance-sheet in connection with the recent exhibition showed a small credit, which it was decided to hand over to the Wallsend Hospital and Toronto Red Cross.

A short paper was read by Mr. Filmer on the propagation of seeds.

Warner's Bay.

At a meeting of the above branch held on 16th April, a paper was read by Mr. J. Winter on the destruction of fruit-fly on peaches and other summer fruits by spraying with arsenate of lead.

Mr. WINTER maintained that when spraying for the codlin moth, many adult flies of other kinds were also poisoned. He was of this opinion because when he had sprayed a pear tree near his house the house-flies were not so numerous. If it could be taken from this that adult flies could be poisoned with arsenate of lead, why should not the fruit-fly be poisoned the same way? All fallen fruit should be picked up every second or third day at the outside. The time had come, continued Mr. Winter, when everyone should be compelled to spray all summer fruit with arsenate of lead. He stated he had found the fruit-fly in his orchard this season, particularly in the date plum.

DEPARTMENTAL NOTE.—The Fruit Expert states that the Department has no record that spraying with lead arsenate will kill the adult fruit-fly, though in an American bulletin on the cherry fruit-fly of America, it is stated that there were indications that spraying with lead arsenate did reduce the fruit-fly. The Department has, however, had good results from using poison pollard baits, the method of mixing which is given in Farmer's Bulletin No. 72, "Spraying." At the same time, destroying by burning or boiling all infected fruit still remains the chief method of keeping this pest under control.

Wellington.

The monthly meeting of this branch was held on 29th April, Mr. F. A. Kenyon presiding.

Mr. D. A. Rich read a paper relating the results obtained on the wheat plots at his farm since 1913.

The experience obtained on the plots had satisfied him that Federation was the best variety, on the whole. It had come out on top in four years out of the six, and he had found it yield well, even for hay purposes. Warden was one of the finest hay varieties for the district, and, as a grain yielder, it was not far behind Federation. The plots had shown it was profitable to use superphosphate, but it was practically throwing away money if the ground had not been properly ploughed and fallowed. He had two sports on his plots—"Billy Hughes" and "Red Wing," both of which promised to be good milling wheats. In 1913 he had only eight heads, but in 1917 he had 900 bags—evidence of their yielding capacities.

He was an advocate of fallowing, but it was impossible to fallow as one would like to. A long fallow was desirable for Wellington district, but it should be kept free from weeds, and the top not too fine. He did not work the ground deeper than 4 inches.

Woonona.

The usual monthly meeting of this branch was held on 11th March, when an interesting discussion took place on the subject of chicken raising.

CHICKEN RAISING.

Mr. THOMAS considered that one soft feed per day was much better for young chicks. Dry feed would then be beneficial to the chicks, as a change of diet. Soft feed was cheaper, and this would balance the extra labour of mixing. The soft feed was prepared as follows:—Finely sifted pollard scalded, then rubbed through the hands into fine pellets, with finely chopped green feed added. At the age of four to five weeks a small quantity of meat meal was added to help to build up a fine strong frame. Many people in mixing feed for chickens used cold water and got the feed into a sloppy state. Food given in this form was very wasteful. Much of it was left lying on the ground to go sour. Should it be eaten after by hungry chicks it was very injurious to them. Great care should be taken in scalding pollard. He urged that the water should be boiling and then worked into the meal until it was in pellets about the size of a grain of wheat.

Mr. CAVILL said that in the rearing of healthy chicks care should be taken that only strong vigorous birds were used in the breeding pen. When the chicks were hatched they should not be fed for at least forty-eight hours. They should then be given equal quantities of rolled oats and bran rubbed between the hands to make it a little finer. This should be given for, say, the first week, feeding a little at a time, say, every two hours. Fresh water should be kept constantly before them; care should be taken that the water was shaded. Fine grit should also be kept constantly before them. In rearing chicks with the hen, it was advisable to have the hen in a coop with a small chicken run attached. This should be moved nearly every day on to fresh grass. After the first week the chicks should be put on a grain ration ground fairly fine, in addition to the dry mash. He used one part each of bran, pollard and oatmeal, and one-half part of linseed meal, and for a change gave wheat and corn in equal quantities ground fairly small with a corn cracker, increasing the size of the grain as the chicks increased in size.

Mr. FOWLER was a very strong believer in dry feed for chickens, being economical and safe.

Mr. JONES complained of the system of using boiling water for mixing the mash, preferring water that was not quite boiling. He liked to give free range as early as possible for chickens.

DEPARTMENTAL NOTE.—Mr. J. Hadlington, Poultry Expert, comments on the above, agreeing in the main with the points made by Mr. Thomas. He says, however, that while cold water is unsuitable for mixing the mash, it is not absolutely necessary that the water should be at boiling point. Bran is omitted from the mash advocated by Mr. Thomas. It is a valuable food for chickens, and may form, say, one-third or more of the entire mash. A difference of opinion in regard to the dry mash as advocated by Mr. Cavill is allowable as to adult poultry, but it is considered altogether unsuitable for chickens.

The Woonona branch held its initial flower show on 26th April, a most attractive display of blooms being staged. The venture was a distinct success, and is regarded as the forerunner of others.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	A. Buchhorn, Albury.
Baan Baa	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bankstown	J. W. Cunningham, Brancourt avenue, Bankstown.
Bathurst	J. McIntyre, Orton Park.
Batlow	A. C. Arnot, Batlow.
Beckom	H. Horsburg, Beckom.
Bimbaya	J. R. Boller, Tantawanglo.
Blacktown	R. H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell).	C. A. McAlister, Bloom Hill, O'Connell.
Bobin	Chas. Pfeiffer, P.O., Marlee, via Wingham
Borambil	H. A. D. Crossman, "Homewood," Quirindi.
Braidwood	A. Page, Braidwood.
Brocklesby	J. Hunter, Brocklesby.
Buckaroo	P. J. Crowley, Buckaroo.
Bungalong	G. H. Pereira, Grenfell Rd., via Cowra.
Canadian	F. W. Taylor, Canadian Lead.
Cardiff	John Cockburn, Cardiff.
Carlingford	F. H. Harvey, Bay Road, Epping.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Clovass	W. G. Cox, Tatham.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Rowcliff, Cow Plain, Collie.
Comboyne	J. J. Dolton, Comboyne.
Coonabarabran	H. H. Moss, Coonabarabran.
Coradgery	M. J. Kelk, Black Trundle Road, Parkes.
Coraki	G. A. Forrest, Coraki.
Cordeaux-Goondarin.	G. H. Walker, Upper Crown street, Wollongong.
Coreen-Burraja	—
Corowa	R. Dwyer, Corowa.
Cotta Walla	T. A. Howard, Cotta Walla, Crookwell.
Crudine	F. W. Clarke, Crudine.
Cumnock	K. J. Abernethy, Cumnock.
Cundletown	S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla.	J. D. Berney, Eurimbla, via Cumnock.
Cunningham	B. J. Stocks, Linden Hills, P.O., Cunningham.
Deniliquin	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	Geo. Turvey, Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Eulomogo	J. H. Stinson; Eulomogo.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook	W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	W. Thompson, Forest Ck., Frogmore
Garra & Pinecliff	S.W. Packham, "Clifton," Pinecliff.
Gerringong	J. Miller, Warrabank, Toolijooa.
Glenorie	J. Hutchinson, Cattai Rd., Glenorie.
Grenfell	A. A. Patterson (*pro tem.*), Grenfell.
Gunning	E. H. Turner, Gunning.
Hay	F. Headon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
Hillston	M. Knechtli, Hillston.
Holbrook	Frank F. Forster, Holbrook.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jilliby-Dooralong	K. A. Smith, Jilliby, Wyong.
Jindabyne	Sylvester Kennedy, Jindabyne.
Keepit (Manilla)	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	J. M. Firth, Kellyville.
Kyogle	J. Martin, Kyogle.
Leech's Gully	James Donnelly, Leech's Gully.
Leeton	W. J. Monfries, Farm 521, Leeton.
Lidcombe	H. Laman, Martin-st., Lidcombe.
Lisarow	A. L. Kelman, Lisarow.
Little Plain	F. S. Stening, Little Plain, via Inverell.
Lower Portland	W. C. Gambrill, Lower Portland.
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham	A. E. Caldwell, Erina.
Meadow Flat	T. L. Williams, Meadow Flat, via Rydal.
Middle Dural	A. E. Best, "Elliceleigh," Dural.
Milbrulong	F. W. Gollasch (*pro tem.*), Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Miranda	A. C. Wigzell, Sutherland.
Mittagong	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya.
Moss Vale	W. G. Bale, Moss Vale.
Narellan	G. J. Richardson, Narellan.
Narrandera	James Faulkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains.
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville	W. J. Angilley, Orangeville, The Oaks.
Orchard Hills (Penrith).	K. Basedow, Orchard Hills, via Penrith.
Parkesbourne	S. W. McAlister, Parkesbourne.
Peak Hill	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	L. S. Pieremont, Penrose.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue)	E. Miskle, P.O., Lue.
Quaker's Hill	C. Gardner, Blacktown.
Rawsonville	G. R. J. Hovenden, Rawsonville.
Redbank	J.J. Cunningham, Redbank, Laggan.
Ringwood	Wm. Tait, Ringwood.
Robert's Creek	J. W. Morrissey, Robert's Creek.
St. Marys	W. Morris, Queen-st., St. Marys.
Sackville	Arthur Manning, Sackville.
Sherwood	J. E. Davis, Sherwood.
Speedwell (W. Wyalong).	B. Noonan, Speedwell, W Wyalong
Spencer	H. J. Woodbury, Spencer.
Springside (via Orange).	W. P. Scarr, Springside.
Stockinbingal	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Stratford	P. H. Deards, "Loch Maree," Stratford.
Tallawang	Selwyn E. Hinder, Tallawang.
Tallong	W. Snushall, Tallong.
Tangmangaroo	A. Thompson, Kangiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, "Chacewater," Chellington, Temora.
Tennyson (North Richmond).	H. C. Croft, Kurrajong.
Thyra-Bunaloo	C. H. M. Smith (*pro tem.*), Thyra, via Moama.
Tingha	M. L. Levitt, Tingha.
Toronto	J. Froome, Knowle Farm, Toronto.
Ulan	P.S.D. Howarth, Ulan, near Mudgee.
United Peel Riv. (Woolomin).	C. J. MacRae, Woolomin.
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	E. Crouch, "Estella," Wagga.
Walla Walla	H. Smith, Walla Walla.
Wallendbeen	W. J. Cartright, Wallendbeen.
Walli	C. T. Allen, Walli.
Warner's Bay and District.	J. Raw, Fairfax-st., Spiers' Point.
Wellington	L. Jurd, Warne-st., Wellington.
Wetherill Park	A. J. Hedges, Wetherill Park.
Windsor	W. H. Spinks, Windsor.
Wollun	J. B. Anderson, Wollun.
Wolseley Park	L. M. Evans, Wolseley Park.
Woonona	H. Coltman, Woonona
Wyan	—
Wyong	Edgar J. Johns, Wyong.
Yass	C. N. Howard, Yass.
Yarramalong	E. Hodges, Yarramalong.
Yetholme	—
Yurrunga & Avoca	F. Saville, Yurrunga.

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1919.

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2nd July, 1919.

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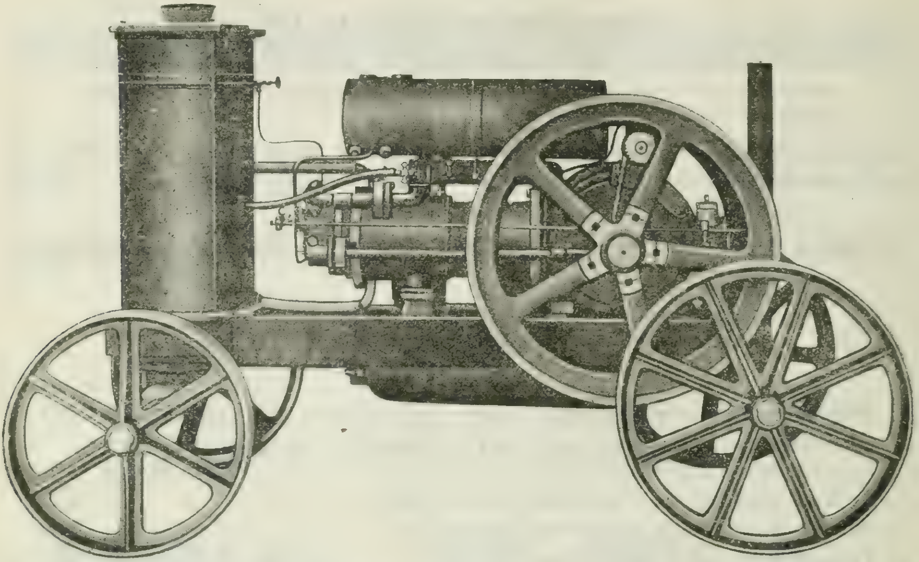

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Agricultural Gazette of New South Wales.

Wheat Grading in America.

E. HARRIS, Department of Agriculture.

DURING a visit to America of eight months' duration, spent principally amongst wheat elevators and at wheat centres, I was greatly impressed by the system of wheat grading in that country. By the courtesy of the United States Department of Agriculture (Grain Standardisation Branch and Bureau of Markets), I was enabled to make a close study of the methods employed by the Federal and State Governments in connection with their system, spending a considerable time with the samplers in rail-road yards, elevators, flour mills and vessels, and in the laboratories of the State authorities, as well as those of the Federal Grain Supervisors.

Until quite recently there was no Federal system of grain grading in the United States. The principal wheat-producing States had legal standards for grain, and the grades were decided by a staff of inspectors employed under a State Department or an official Chamber of Commerce. The standards differed in each State, and as a consignment of wheat passed from west to east it was possible for its classification to be improved according to the State in which it was graded. Some of the States had a law making it obligatory for any wheat passing through an elevator within their boundaries to be regraded by the State Inspectors, a small fee being charged for the service.

For many years before attempting to fix the classification of wheat or other grains, the United States Department of Agriculture, through the office of Grain Standardisation, carried out investigations into the varieties of wheat grown throughout the States, "the fitness of the several types for the manufacture of white flour, and the adaptation of the flour from these several types to the manufacture of different kinds of bread products," as well as the milling value—the flour-yield and flour-strength of these varieties. However much the grower may aim at obtaining maximum quantity production, *i.e.*, bushels per acre, it must be remembered that the ultimate object of wheat is the manufacture of flour, and that variety is of most value to the miller which yields the highest percentage of "strong," sound, white flour. Hence any method which aims at determining the relative value of varieties of wheat must take these factors into consideration, as well as those which usually occupy a more prominent position in commercial valuations, such as weight per bushel, soundness, general appearance, and the presence of impurities.

The Grain Standards Act of the United States empowers the Secretary of Agriculture to fix standards for quality and condition, and the result of the many years' work of the office of Grain Standardisation was made evident in the year 1916, when official standards for wheat were proclaimed to become effective on the 1st December, 1916. The Government had guaranteed to the farmers a minimum price per bushel for wheat, and it was considered there should be a uniform system of grading and valuation throughout the whole of the States. As a result of one season's working, slight alterations were made in the classifications, and revised standards came into operation on 15th July, 1918. These standards are still in force, and they are, of course, arranged to suit the varieties of wheat grown in the country.

Primarily, wheat is divided under the American system into six principal classes, viz.:—

Class I—Hard red spring wheat.
Class II—Durum wheat.
Class III—Hard red winter wheat.
Class IV—Soft red winter wheat.
Class V—Common white wheat.
Class VI—White Club wheat.

First of all, a definition of "wheat" is given; it is described as "any grain which, when free from dockage, contains not more than 10 per centum of grain of a kind or kinds other than wheat." Each class may include all varieties of wheat which is covered by the classification, and not more than 10 per cent. of other wheats.

For the purpose of grading, the classes are each divided into six grades, and the following table giving the grade requirements for Class V, common white wheat, will exemplify the system:—

Grade No.	Minimum Test Weight per bushel.	Maximum limits of—						
		Moisture.	Damaged kernels.		Foreign material other than dockage.		Wheats of other classes.	
			Total.	Heat damaged.	Total.	Matter other than cereal.	Total.	Durum.
	lb.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
1	60	13·5	2	0·1	1	0·5	5	2
2	58	14·0	4	0·2	2	1·0	10	3
3	56	14·5	7	0·5	3	2·0	10	10
4	54	15·5	10	1·0	5	3·0	10	10
5	51	15·5	15	3·0	7	5·0	10	10
Sample	......	......	......	......	......	......	......	......

The wheat in No. 1 grade must be bright, and in Nos. 1 to 4, inclusive, cool and sweet. The wheat in No. 5 grade must be cool, but may be musty or slightly sour. Sample grade wheat may contain any commercially objectionable foreign odor, except that of smut, garlic or wild onions, or may be very sour, or be heating, hot, infested with live weevils or other insects injurious to stored grain, or be otherwise of distinctly low quality, or contain small, inseparable stones or cinders.

The Department of Agriculture not only specifies the grade requirements, but also defines the manner by which the grain is to be tested. The test weight per bushel is the weight per Winchester bushel arrived at by taking a sample of about 1,000 grams of wheat freed from dockage, and passing it through an official testing machine. This consists of a quart tester filled from a hopper having an opening 1¼ inches in diameter at its base, firmly supported 2 inches above the quart kettle. The excess grain is struck off in a uniform manner with three zigzag motions by the side of a special stroker held vertically. The beam of the machine shows the weight per bushel in pounds and fractions.

The moisture content is arrived at by means of a Brown and Duval moisture tester, but in commercial grading it is very seldom necessary to make use of the machine to determine whether wheat contains, say, 14 per cent. of moisture.

The percentages of "damaged kernels," "foreign material other than dockage," and "wheats of other classes" are decided by actual weighings from small samples of about thirty grams. The methods of obtaining true samples will be described later.

Definitions are given for all the terms used. "Foreign material other than dockage" includes all matter other than wheat which is not separated from the wheat in the proper determination of the dockage, except as provided in the case of smutty wheat. "Heat-damaged kernels" are kernels or pieces of kernels of wheat which have been distinctly discoloured by external heat, or as a result of heating caused by fermentation.

The determination of dockage, moisture, temperature, odor, onions, garlic and live weevils or other insects injurious to stored grain is made upon the basis of the grain including the dockage. All other determinations are upon the basis of the grain when free from dockage. Percentages, except in the case of moisture, are percentages ascertained by weight.

The farmer is paid only for the grain in his consignment, and not for any admixture of rubbish it may contain. The material other than grain is known as "dockage," which is defined as "sand, dirt, weed seeds, weed stems, chaff, straw, grain other than wheat, and any other foreign material which can be removed readily from the wheat by the use of appropriate sieves, cleaning devices, or other practical means suited to separate the foreign material present; also undeveloped, shrivelled, and small pieces of wheat kernels removed in properly separating the foreign material, and which cannot be recovered by properly re-screening or re-cleaning." The quantity of dockage is stated in terms of percentage on the total weight of grain in a consignment, and the weight of grain paid for is reduced correspondingly. When it is less than 1 per cent. it is disregarded. The official method of determining the dockage is by means of hand sieves, the dimensions of the perforations being given, or by the use of a device which is known as a "kicker" and which removes barley, oats, wild oats, pieces of straw, weed stems, and other coarse material from wheat. The former process is exceedingly slow, and the "kicker" is in general use, both commercially and by the testing authorities. By its use, and with the assistance of appropriate scales, the percentage of dockage in a parcel can be determined in a few minutes.

It is of very little use taking infinite pains to determine the correct grade of wheat, unless it is certain that the sample used is truly representative of the parcel of wheat valued. Consequently, great importance is attached to the method of sampling, so that the sample on which the grade is based shall truly represent the whole of the parcel. In the United States most of the grain is sampled by car lots on arrival at some important wheat centre. A car of wheat holds approximately 60,000 lb. (1,000 bushels) in bulk. For the purpose of obtaining the sample a grain trier or probe is used which is sufficiently long to reach from the load line of the car to the floor. It is double tubed with ten separate compartments, which are closed when the trier is inserted in the wheat from the top, opened by means of a handle on top to enable the compartments to fill, closed, and then withdrawn full. The grain is then emptied on to a canvas so that the wheat in each compartment of the trier can be examined separately. The use of such an instrument makes it possible for the sampler to note any unevenness in the loading of the car, and the location of any quantity of mixture of grain of inferior quality. The trier is inserted five times in each car-load at different spots. The sample for testing must be at least 2 quarts in size, half of which is placed in a clean air-tight container (for the moisture test), and the remainder in a clean cloth sack.

When the car is loaded with grain at the country elevator, the door is sealed. The sampler at the testing centre breaks this seal to get his sample, but he takes a note of its number, and the number of the car, and reseals the door, noting the new number against the old one. The seal is not further tampered with until the car is unloaded at the mill or elevator, or unless the grain is again tested.

The samples are then taken to the testing office, and the grain in the air-tight containers is immediately used for making the moisture test. These are made in duplicate, 100 grams being required for each test. The allowable percentage of moisture ranges from 13·5 to 16·0, according to the grade of the wheat.

The weight per bushel is determined on the machine already described, and then 1,000 grams is passed through the "kicker" to determine the dockage. Another 1,000 grams is put through a sampling device, which will divide a sample into smaller portions, and still maintain the proper proportions of the mixture of grain and foreign substances of the original sample. By this device three true samples, each of 30 grams, are obtained. These small samples are used for the purpose of determining the percentage of damaged kernels, foreign matter other than dockage, the varieties of wheat whether hard or soft, and wheats of other classes. These percentages are found by weighings on fine balances. The results are tabulated against the number of the car from which the sample was taken, and the seal number.

The first valuation of the wheat is made when the farmer delivers his grain in a grain waggon containing some 125 bushels to the local elevator. The operator takes a sample of the load, determines the weight per bushel by his weight per bushel machine, arrives at the dockage by means of a "kicker" and a suitable scale, and from experience can tell that the grain does not contain more than the maximum moisture allowed. The variety is determined by eye test. These operations are carried out while the wheat is being emptied into the receiving hopper and being elevated. If the farmer is satisfied with the grading the wheat is binned with grain of the same quality. If not, it is placed in a separate bin until the grading can be definitely decided.

As previously mentioned, the sampling and testing are carried out by the State authorities, and at a busy centre like Kansas city the inspectors are able to arrive at many of the determinations without resource to laboratory appliances. In the case of a dispute or appeal against a grade allotted, a Federal grain supervisor, who is stationed at every wheat centre, determines the grade by the procedure set out above.

The valuations in California for local wheat were on the following lines (dollars and cents transposed into shillings and pence) :—Hard white—Basic price, 9s. 2d. per bushel; soft white—1d. per bushel off.

Grade No. 1—Test Weight,	60 lb.	No discount.
,, ,, 2 ,, ,,	58 ,, ...	1½d. per bushel off.
,, ,, 3 ,, ,,	56 ,, ...	3½d. ,, ,, ,,
,, ,, 3 ,, ,,	55 ,, ...	4½d. ,, ,, ,,
,, ,, 4 ,, ,,	54 ,, ...	5½d. ,, ,, ,,

The cargoes of New South Wales wheat lately sent to America, when graded by the United States standards, carried a "dockage" of from 1 to 3 per cent. The presence of live weevil should have placed the grain in Sample grade, but notwithstanding this the authorities allowed it to be graded as though it were clean. It came, therefore, within Class V, common white wheat, sub-class (*b*) soft white, and as the weight per Winchester bushel ran from 56 lb. to below 58 lb. it went into No. 3 grade.

The Canadian Method.

In Canada, wheat grading is uniform throughout the Dominion, and is governed by the Canada Grain Act, 1912, which specifies the minimum weight per bushel of each grade, and what wheat each grade is to consist of. For instance—

Spring Wheat.

No 1 Spring wheat shall be sound and clean, weighing not less than 60 lb. to the bushel.

No. 2 Spring wheat shall be sound and reasonably clean, weighing not less than 58 lb. to the bushel.

No. 3 Spring wheat shall comprise all sound wheat not good enough to be graded as No. 2, weighing not less than 56 lb. to the bushel.

Rejected Spring wheat shall comprise all spring wheat, fit for warehousing but too low in weight or otherwise unfit to be graded as No. 3.

Other classes are—

Goose wheat, three grades, ranging from 55 to 61 lb. per bushel.
Winter wheat, eight grades, ranging from 57 to 62 lb per bushel.
Spring wheat (Western Division).
Winter wheat (Western Division).

In addition to the grades set by the Act, there are "commercial grades" which may be fixed each year by a Grain Standard Board, should the climate or other conditions result in the production of a considerable portion of grain not capable of being included in the classification provided for in the Act.

The requirements of the various grades are not so specifically defined as in the United States regulations. The Canada Grain Act does not fix the moisture content, nor percentage of admixture of foreign material, but I was informed that it is generally acceded that any grain carrying anything in excess of 14 per cent. of moisture would be considered as "tough grain," and that in regard to foreign seed, as the grades specified in the Act are on the basis of reasonably clean grain, any grain not clean enough, in the opinion of the Inspector, to be graded straight grade, has dockage set upon it for the purpose of eliminating the foreign matter.

After the initial grading and valuation for the purpose of purchase from the farmer at the country elevator the wheat is trucked in box cars and despatched eastward. Nearly the whole of the wheat of the western grain-growing provinces passes through Winnipeg, en route to the Great Lakes. Winnipeg is the headquarters of the Western Grain Inspection Division, and here it is obligatory for every car-load to be officially tested and graded before proceeding eastward. Opportunities are given for appeals to be lodged against the grading while the wheat is en route to the shipping ports on the lakes, in which case a survey is held on arrival of the car. The grade allotted at Winnipeg is the grade in which the wheat is sold on the overseas market, a Government certificate being issued to cover it.

The methods of sampling and testing are practically the same as those which have been adopted in the United States and similar machines are used. Briefly stated the grade of the grain depends on—

1. The quality, which in turn depends upon soundness, colour, weight, and percentage of hard wheat;
2. The condition, depending upon moisture content, heat, &c.
3. The admixture, which is determined by sieving and weighing.

The Canadian system of grading has withstood the test of many years' operations, and the official certificates are relied upon and accepted in the wheat markets of the world as a correct representation of the quality of the grain they cover. The United States system was inaugurated after the commencement of the war, and has therefore been in operation only over a period during which the control of the buying and selling of wheat has been in the hands of the Government, but there is no reason to doubt it will be as successful as the Canadian system when trading is resumed under normal commercial conditions.

Neither system in its entirety would be suited to Australian conditions, but a modification of the Canadian system would simplify the valuation of wheat in ordinary commercial transactions, freeing the mind of the farmer from the suspicion that he was "not getting a fair deal." Incidentally, as the farmer would get a higher price for good clean wheat than for poor, dirty grain, it would also encourage clean farming and the growing of improved varieties.

Grasses and Clovers on the Nambucca River.

FARMERS' EXPERIMENT PLOTS.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE commonest dairying grass on the North Coast, from the Macleay River to the Queensland border, is undoubtedly Paspalum, but many as are the advantages attached to that grass it is evident, from the numerous requests received from dairy-farmers about trials of other grasses, that it is not the "all-in-all" for their purposes.

With the end in view of demonstrating that there are grasses and clovers that provide a most desirable change of feed, experiment plots have now been established in various centres on the coast, and the report that follows concerns plots established over twelve months ago, whereon certain fodder plants have shown to some extent their capacity to combat weed growth, their behaviour under stocking, their comparative palatability, and, finally, the measure of their resistance to drought.

The plots were laid down on the farm of Mr. J. Giblin, Upper Taylor's Arm, Nambucca River, about 30 miles from Macksville. The soil cannot be considered good, the upper reaches of the Nambucca having been classed as fair soils, consisting of metamorphic slate and schists, but the alluvial soil in the creek valleys would be considered superior to the "fair" soils of the hills.

The different plots laid down were as follow:—

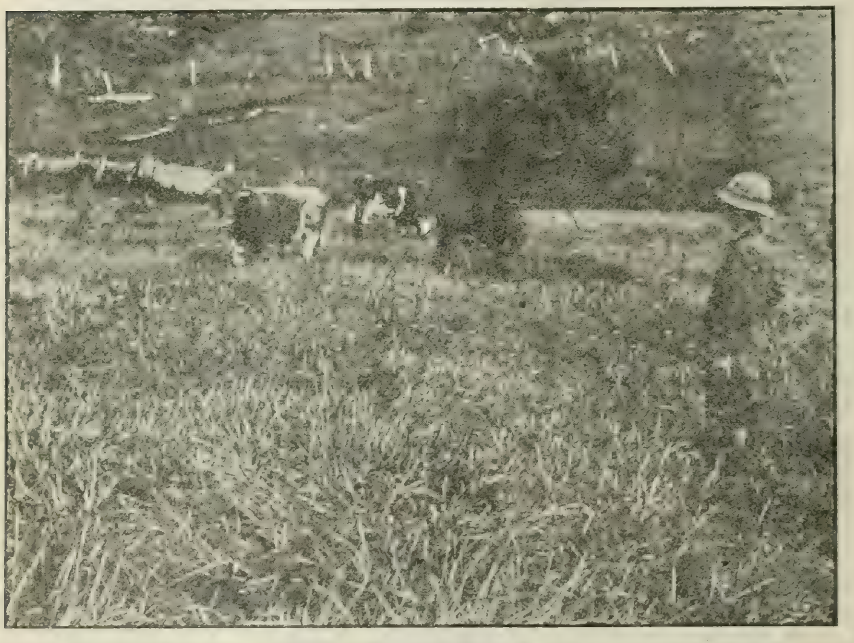
1. Cocksfoot, Rye grass and Prairie grass.
2. Tall Oat grass (*Avena elatior*) and Bokhara clover.
3. *Bromus inermis* and Chilian clover.
4. *Phalaris bulbosa* and White clover.
5. Elephant grass with native grasses (Coolah and Warrego Summer grass), and the introduced Texas grass sown between the rows.
6. Rhodes grass and Lucerne.
7. Para grass.

With the exception of that used for the first plot all the seed was obtained from the experiment farms.

The Behaviour of the Plots.

The best pasture of all has been that of Bokhara clover and *Avena elatior*. Mr. Giblin testifies that the growth has been consistent from the time of sowing. The plot was continually grazed prior to the drought, the clover being eaten with great avidity. During the protracted spell of dry weather of the past summer and autumn the clover ran away from the grass, and in spite of the phenomenal conditions provided grazing continually. Considering the deep root system of this clover its drought resistance is easily understood.

The stock were removed from all the plots about a week before Easter, and at the time of writing (22nd May) the clover is fully 4 feet high and the Tall Oat grass 2 feet 6 inches high. This pasture should provide feed right through the winter. Since the rain the grass is holding its own with the clover, but it will not be surprising if it is eventually smothered owing to the strong stooling habit of the clover.



Phalaris bulbosa **and White Clover.**

The plot of *Phalaris bulbosa* and White clover has also been remarkably successful, and Mr. Giblin states that the *Phalaris* is a particular favourite with stock. This plot was grazed during the drought right down to the ground, and it was feared that the growth of summer grass might kill it and the clover, but since the rain both have shot away and completely smothered all weeds. The *Phalaris bulbosa* now averages 2 feet in height, while the White clover, in fine big stools, is fully 12 inches high. An interesting feature in connection with this plot is the manner in which the White clover holds its own with the *Phalaris bulbosa*.

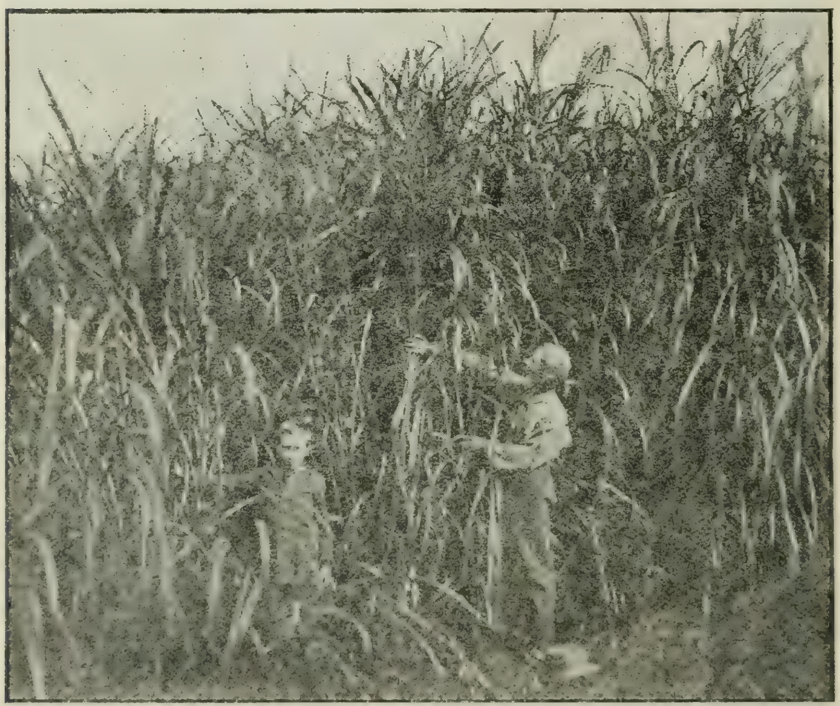
The plot of *Bromus inermis* and Chilian clover has not been as successful as the others. No fault can be found with the clover, which has stools 18 inches in circumference at the base, but the *Bromus inermis* has been very

Bokhara or Sweet Clover and Tall Oat Grass (*Avena elatior*).

Chilian Clover and *Bromus inermis* in the foreground. Bokhara or Sweet Clover in the background.

GRASSES AND CLOVERS ON THE NAMBUCCA RIVER slow in its growth, enabling the weeds to hold sway. Since the rain, however, the plot has recovered wonderfully, and as the grass bears the American reputation of not being at its best until the second or third year a great improvement may result during the ensuing season.

The Cocksfoot, Rye and Prairie plot has resulted in the Cocksfoot taking possession, and the other two are now practically absent. This state of things has probably been hastened by the previous drought, as we all know what a poor drought resister Rye grass is. Cocksfoot is evidently a grass very much adapted to this locality.



Elephant Grass.

Growth obtained by permitting maximum development without any cutting. These plants, 14 feet high, were from single cuttings planted six months before. Note the comparative absence of leaf at the base of the stalks.

The Rhodes grass and lucerne plot is also a pronounced success. Although only an acre was laid down, Mr. Giblin succeeded in harvesting two bags of seed from the plot for sowing amongst the "burns." Since the rain the Rhodes grass has shot away, and it now stands 4 feet high with the promise of another fine crop of seed. The palatability of this grass is well proved by the manner in which it is grazed right down to the ground in another paddock, and Mr. Giblin considers it more palatable and possessed of more "body" than Paspalum.

It has now been proved, both here and at Cowra, that lucerne grows well with Rhodes grass, and as it is a valuable adjunct to a pasture the combination deserves the serious consideration of dairy farmers.

Para grass is promising. Unfortunately the plot laid down was small, but what there is has thrown out runners 12 feet in length and should eventually spread over a big area.

The most successful grass of all from a yield point of view is Elephant grass. Mr. Giblin was so struck with the small plot of this grass first established that he soon extended it, and he now possesses quite a big area.

Elephant Grass.

The second cutting for the season. Notice that more flag develops after cutting, particularly at the base of the stalks. The clumps averaged 70 lb. each.

Inter alia he has provided an opportunity of studying its characteristics under three different treatments:—(*a*) When it is allowed to grow to maturity without interference; (*b*) when it is cut at a height of 6 or 7 feet; and (*c*) when it is grazed.

Elephant grass reaches an enormous height if allowed to grow unchecked. Cuttings planted in the spring are now 14 feet high, with an average of twenty-four stalks to a plant. The cuttings were planted 4 feet apart and 4 feet 6 inches between the rows, and it may yet be proved that this method is preferable to planting 6 feet apart as previously recommended, inasmuch as it encourages a finer, softer stalk. The leaf development on the stalks when the plants are thus allowed to grow is sparse compared with that when it is kept cut, there being on an average twenty leaves to a stalk. The rainfall for the last six months of 1918 was 604 points, so that the growth was remarkable under the conditions.

Mr. Giblin testifies that in the case of the plot where he cut the grass at about 7 feet high, it proved of great value during the drought, as the cows not only ate the leaves, but also the stalks. The cutting has resulted in a much denser growth of flag, and the plants are again fully 12 feet in height.

Elephant Grass.

This plot had been grazed off, the stalks being stripped bare of leaves by the stock. In one week fresh, succulent leaves, 6 to 12 inches long, have developed.

Where cows were allowed to graze the Elephant grass it was noticed that they ate it from the top to about the middle, and the grazing resulted in the sending out of leaf growth much finer than the original. To what extent the grass can be grazed has not yet been shown.

Settlers on the Dorrigo and Nambucca have met with striking success by sowing Rhodes grass seed amongst the burned logs and timber of newly-felled country, and this practice can be confidently advocated. Mr. Giblin has shown, however, that Bokhara clover and *Avena elatior,* and to a less extent Chilian clover, can also be sown in this way. The clover is growing particularly well amongst the weeds, and its future development is being awaited with much interest. Elephant grass was planted out in the scrub by one settler, but was unfortunately eaten down and destroyed by "paddymelons."

Conclusions.—Present results show that the following grasses and clovers can be confidently recommended for the Nambucca River:—

Grasses.—

Elephant or Napier's Fodder.
Rhodes.
Tall Oat (*Avena elatior*).
Phalaris bulbosa.
Cocksfoot.
Sudan.

Clovers.—

Bokhara.
Chilian.
White.

For drought periods, Elephant grass (and Sudan) are superior to all others, and most valuable, while Bokhara clover has proved to be superior to all other clovers in this respect.

Elephant grass can be utilised for grazing as well as cutting, but to what extent has not yet been ascertained.

Lucerne has been proved to do well when sown with Rhodes grass.

Bokhara clover may prove a valuable fodder to sow in "burns."

STABLE MANURE OR FERTILISERS—WHICH?

"I FIND it difficult to obtain stable and cow manure that is free from weeds," writes a correspondent who cultivates asparagus on the Central Tableland, and who was under the impression that some fertilisers would be as effective. The reply of the Chief Inspector was that well-rotted manure of the kind mentioned was most suitable, owing to it acting as a mulch as well as plant food. In its absence a mixture of equal parts of superphosphate and blood and bone, at the rate of about 2 cwt. per acre, applied about August would be suitable.

WHITE PANICUM AS A FODDER PLANT.

WRITING from the Hunter Valley, a farmer asked whether White Panicum would provide him with fodder in dry weather sufficient to justify its use. He had heard and read good reports of it.

The Agrostologist replied that as far as the Department's experience went White Panicum is inferior to Hungarian millet under dry conditions, and decidedly inferior to Japanese and Manchurian under normal conditions. In any case, unless the climate is particularly cold, Sudan grass is superior to all the millets; it produces more cuttings of fodder, and is equal if not superior in fodder values.

Insects and St. John's Wort.

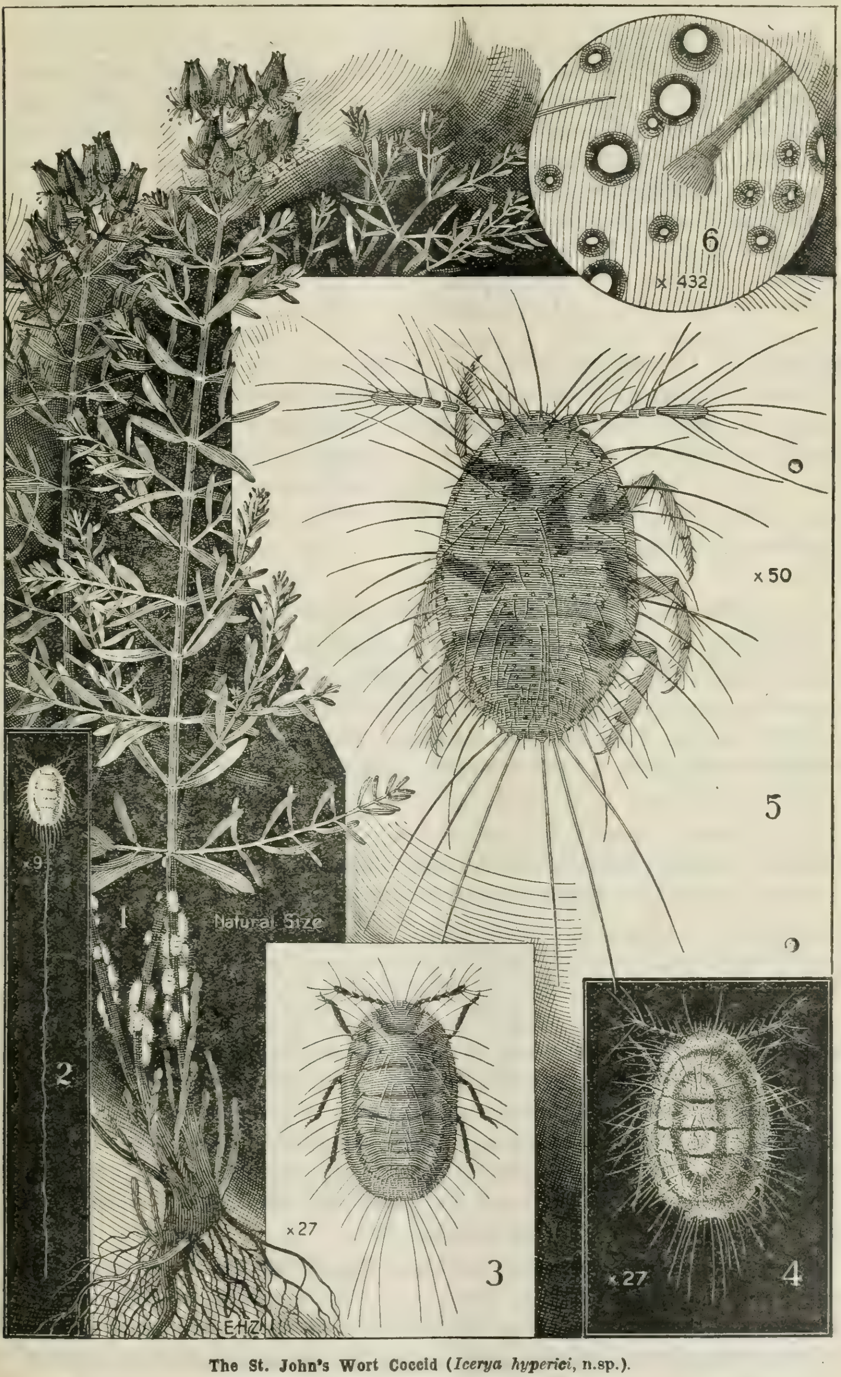
WALTER W. FROGGATT, F.L.S., Government Entomologist.

About fifteen years ago St. John's Wort (*Hypericum perforatum*) was reported to be rapidly spreading over the cultivation paddocks of the Ovens Valley, in south-eastern Victoria, and in 1905 Mr. French was sent by the Department of Agriculture to investigate. His report, published in the *Journal of Agriculture* of that State, was illustrated with photographs showing the nature of the damage caused by this persistent weed in the neighbourhood of Bright, where it had been known as the "Racecourse weed" for over twenty-five years, and had only begun to spread a few years previously. A number of experiments were carried out with sprays and poisonous mixtures to eradicate the pest, but without accurate conclusions being arrived at.

Lately attention has been called to the spread of St. John's Wort in New South Wales, chiefly in the Mudgee and Tumbarumba districts, and only last year a considerable amount of interest was created about the weed by the Federal Bureau of Science and Industry including it in their list of insect and plant pests which were to be dealt with from a Federal standpoint.

Any one who has examined St. John's Wort in the field will have noted with surprise the wonderful root development, so admirably adapted for its struggle for existence. Originally a heath plant, it produced a long, stout tap root, with a network of finer lateral rootlets to gather up the surface moisture. Roots such as these when cut by the plough or scarifier and turned under near the surface have the power to send up suckers from the tips and thus to produce fresh plants. When the plants are cut off close to the surface it requires but the least moisture to bring forth a fresh growth of young stems, and if the growth is burnt off there will be a fresh shoot with the first rainstorm.

Last year (1918) the public were informed through the newspapers that the Federal authorities were making inquiries in England with a view to importing "millions of ladybird beetles to eat up St. John's Wort." The beetle in question is not a ladybird beetle, however, but a plant-eating beetle belonging to the family *Chrysomalidæ*. Its native food is the foliage of these plants, and Forster, describing the beetle as *Chrysomela hypericum* in 1771, named it after its food plant. It has a wide range over Europe and Great Britain, but as far as the writer can learn from the literature at his command it has not made much appreciable impression upon the many different species of *Hypericum* in the Old World. The foliage of this erect hardy shrub consists of very small elongate leaves, not unlike that of thyme. It might be possible to confine *Chrysomela hypericum* to its food plant, but an immigrant in a new land might possibly turn its attention to some more succulent Australian plant.



The St. John's Wort Coccid (*Icerya hyperici*, n.sp.).

1. St. John's Wort with insects attached. 2. Larva (first stage). The length of the anal filament is remarkable. 3. Larva (second stage). Woolly secretion removed. 4. Coccid, coated with woolly secretion. 5. Coccid, enlarged to show hairs and spinnerets. 6. Section of derm, magnified to show structure.

The discovery of a native enemy or parasite on the roots and basal stems of St. John's Wort by the writer on a recent visit to Mudgee, proves that we already have a natural enemy feeding upon the most vital part of the plant. The insect in question was found in numbers in all stages of development early last April, many being collected with their food plants and brought to Sydney for study and identification. This parasite is a typical mealy bug (family *Coccidæ*) and comes in the genus *Icerya,* which contains among other species the well-known cottony cushion or fluted scale (*Icerya purchasi*). It has, on careful examination, proved to be an undescribed member of the genus; and a detailed description is appended, giving it the name of *Icerya hyperici.* It has already become well-established on the plants in the Insectarium, the tiny larvæ clustering all over the stems. It is too soon, of course, to make any dogmatic assertions as to its value, but an indigenous mealy bug which reproduces her larvæ in hundreds and lives under the shelter of the soil on the roots, should be quite as effective (if not more so) as a strange beetle from another land which possesses much lower powers of reproduction, and which feeds in the open on the foliage where it is exposed to many enemies.

The St. John's Wort Coccid (*Icerya hyperici,* n.sp.).

The young female is of a reddish yellow colour, clothed on the dorsal surface with a pale yellow flocculent secretion, forming fluffy patches round the outer margin and irregular tufts all over the back, interspersed with fine scattered hairs. From the anal extremity projects a hair-like filament of white secretion, up to $\frac{1}{4}$ inch in length. Length of coccid, $\frac{1}{24}$ inch.

The adult female varies in colour from a light orange yellow to a brick red, but thickly covered with white mealy secretion, forming a marginal fringe of woolly tufts and an irregular ridge of similar matter down the centre of the back. Antennæ and legs black. Length, slightly over $\frac{1}{6}$ inch.

In general form this species is broadly oval, rounded on the dorsal surface, with a well-defined marginal fold running round from the insertion of the fore legs to the anal segment, ventral surface flattened. Both the dorsal and ventral surfaces are clothed with fine scattered hairs, longest on the sides and anal segment. The cephalic and thoracic segments are irregularly wrinkled, with the first eight abdominal segments uniform in size, the anal one rounded to the apex. The antennæ are composed of ten joints, basal ones broad, but of uniform length to the tenth, which is longest, oval and rounded to the extremity. Legs well developed, coxia short, thickened near the apex; femora rather short and thick set; tibia small, slender, curved and furnished with a strong curved tarsal claw.

These coccids are very active, crawling all over the lower portions of the twigs and roots. The species comes near *Icerya nudata,* Maskell, but the structure of the mealy secretion of the female, the long single anal filament of the young larva, and the hairs round the margins seem constant and distinct.

Notes on Wheats entered for the Royal Agricultural Society's Show.

EASTER, 1919.

F. B. GUTHRIE.

BOTH in number and quality the entries in the wheat section for the Easter Show of the above Society, which had to be abandoned on account of the pneumonic influenza epidemic, would have constituted a record. As the possibility of having to abandon the Show was not contemplated at the time the wheat entries were received, it was thought desirable to examine and judge them as would have been done had the Show been held.

Since it was unnecessary to complete the judging by the date originally fixed for the opening of the show, it was possible to subject a larger number than usual to the milling test, and thus to do fuller justice to the competitors. It was fortunate that this was the case, for, on account of the unusually high excellence and evenness of the exhibits, the task of distinguishing between them was more than ordinarily difficult.

Arrangements were made for staging the exhibit, together with cards showing the results of the milling tests and the awards, in the window of Challis House during the first week of June, and the display proved an attractive one.

In addition to the special prizes for Yandilla King, Federation and Hard Federation, instituted last year, there was a class for collections of wheat in the ear, to which a prize of £25 was allotted for division, the total amount donated in prize-money to the section being £150. The entries numbered 139, being a much larger number than on any previous occasion, and the samples were all of exceptionally fine quality.

Not the least pleasing feature of the competition was the fairly even distribution of the prize-money and the inclusion of many new names among the prize-winners, the twelve first prizes being divided among nine exhibitors, and no exhibitor obtaining more than two first prizes. There were also several new varieties exhibited in the Weak Flour class, as will be seen from the table giving the bushel weights of all the samples.

The judges were Messrs. R. W. Harris (Gillespie Bros.) and G. W. Norris (Department of Agriculture), the milling of the samples being carried out by Mr. Norris.

The judging was carried out as in previous years. The bushel weights of all samples were first taken; the results are given in the second of the tables which follow. After careful inspection, to eliminate inferior exhibits, those which were considered eligible for prizes were milled in the model mill of the Department of Agriculture, and the prizes were finally awarded in accordance with their actual behaviour in the mill, points being assigned for the different milling characteristics.

The results of these tests are given in the table headed "Results of Milling Test," in which the figures within brackets are the actual figures obtained, the others being the marks assigned.

The following is the report of the judges :—

"The wheats forwarded for exhibition this year are of excellent quality, and it is most unfortunate that such an exhibit could not have been seen by the thousands that visit Sydney during the Easter holidays.

"Every class is well filled—in fact, it is a record entry.

"The quality of the macaroni wheats is not quite as good as previous years. Some of the samples have a pinched appearance, and in some instances grain from the second growth ears spoilt the appearance of the sample.

"In the Strong Red class there are some excellent samples; a sample of Marquis, grown by Mr. R. H. Thackeray, being very attractive. It is a small dark red berry, free from the mottled appearance that is general with this variety, but when compared with the sample of Cedar, grown by Messrs. D. & J. Gagie, or that grown by Mr. W. H. Scholz, it has not the quality of this strain, being about six quarts per sack weaker.

"In the Strong White class there are several samples of Comeback of very fine appearance, the samples of Comeback grown by Mr. John Ryan, Messrs. D. & J. Gagie and Mr. W. H. Scholz being of excellent quality, characteristic of this type of wheat.

"In the Medium Strong class several new varieties were entered; the most promising as a show wheat is one named Redwing, grown by Mr. D. A. Rich. It is a translucent, dark amber coloured grain, resembling the variety Florence, but the grain is not quite so large. In the mill it behaves well, but will require a few seasons' testing before a definite statement can be made in respect to its milling quality.

"A sample of Florence which secured first prize in its class, grown by Mr. W. H. Scholz, is an excellent wheat, and when milled produced a very good quality flour.

"The sample of Canberra, which came second, grown by Mr. R. Penfold, is worthy of mention, it being an attractive-looking wheat and when milled produced a good quality flour of excellent colour.

"In the Weak Flour class the judging was difficult, there being very little difference between some of the samples. The sample of Warren, which took first prize, grown by Mr. W. H. Scholz, although somewhat dull in appearance, produced a very satisfactory flour. For the second prize, Jade, grown by Messrs. D. & J. Gagie, and Purple Straw, grown by Mr. Daniel Ryan, came a tie, both securing 81 points, therefore divide.

"In the special for Yandilla King, Mr. A. R. Michael easily secured the prize with an excellent sample which stood out far above the remainder of the samples.

"In the special for Ordinary Federation there were two very good samples, which were very superior to the remainder of the exhibits. The sample grown by Mr. A. R. Michael secured the prize, winning by two points, Mr. A. C. Lawrance coming second.

"The exhibit of Hard Federation was similar to the Ordinary Federation, also containing two samples which were far superior to the remainder in the class, Mr. R. Penfold winning by only one point, Mr. W. F. D'Arcy being second. Both samples had a translucent appearance, and when milled produced an excellent quality flour.

"In the new class for 'grain and ears' the first prize went to Sir Joseph Carruthers, for a fine collection of both grain and ears. The different samples of grain in most cases were very good, and named distinctly. The collection of ears was good, being well bunched and distinctly labelled. The ears worthy of special mention were of the following varieties:—Kitchener, Sensation, Marquis, Red Bobs, and the macaroni Kubanka, all of which were attractive specimens."—R. W. HARRIS, GEO. W. NORRIS.

TABLE showing average bushel-weights, gluten-content, and water-absorbing power of wheats of the "Strong White" and "Soft White" classes milled at the Royal Agricultural Society's Show, from 1905–1918.

Year.	Weight per bushel.		Gluten.		Flour Strength. (Water-absorption, quarts per 200 lb. sack.)	
	Strong White.	Soft White.	Strong White.	Soft White.	Strong White.	Soft White.
	lb.	lb.	per cent.	per cent.		
1905	63	64	10·0	9·7	46·6	45·2
1906	63¾	64½	11·0	9·8	48·5	45·7
1907	62½	66	9·3	8·3	48·4	45·4
1908	64½	65	12·2	10·2	52·5	46·4
1909	64¾	65¼	11·9	8·6	53·5	49·2
1910	64½	64	13·8	12·1	50·0	47·8
1911	64½	63½	12·5	11·0	53·4	47·0
1912	65	64	13·4	10·6	52·7	45·2
1913	67	65¼	15·2	11·7	53·1	46·9
1914	67¾	67	12·8	10·6	52·3	45·0
1915	67½	66½	13·1	12·4	53·8	45·7
1916	67¼	67¼	13·0	12·3	53·3	47·5
1917	66	67½	12·4	8·6	54·6	43·0
1918	67	65¾	*	10·2	*	44·5
1919	67½	66¼	10·5	8·9	52·7	43·6

* There were only two entries in the Strong White class in 1918, and these were readily differentiated by the judges without subjecting them to a milling test. The figures for gluten and flour strength are therefore not available.

WEIGHTS PER BUSHEL.

Catalogue No.	Variety.	Bushel-weight. lb.	Catalogue No.	Variety.	Bushel-weight. lb.
Class 943 (Macaroni Wheat).					
126	Indian Runner	65·1	130	Medeah	64·4
127	Huguenot	65·0	131	Kubanka	65·0
128	Indian Runner	64·6	132	Farrer's Durum	62·2
129	Kubanka	66·6			
Class 944 (Strong Flour Red).					
134	Cedar	66·4	139	Cedar	67·0
135	Kharkoff	67·9	140	Marquis	66·6
136	Marquis	66·8	141	Cedar	69·6
137	Prelude	67·2	142	,,	67·4
138	Cedar	66·8	143	Marquis	66·8
Class 945 (Strong White).					
145	Comeback	67·5	151	Comeback	66·8
146	Pusa No. 4	67·0	152	,,	67·7
147	Sensation	65·9	153	,,	65·5
148	Comeback	67·5	154	,,	67·7
149	,,	68·1	155	,,	68·9
150	,,	67·5	156	,,	69 0
Class 946 (Medium Strong).					
157	Yandilla King	66·2	170	Bill's DT	65·7
160	Huron	67·4	171	Yandilla King	67·9
161	Yandilla King	65·7	173	Canberra	66·4
162	Firbank	66·8	174	Federation	65·0
163	Minister	64·4	175	Florence	67·0
164	Yandilla	65·3	176	Redwing	65·9
165	Florence	66·4	177	Florence	67·4
166	Bunyip	66·2	178	Canberra	67·5
167	Florence	66·6	179	Florence	68·7
168	Marshall's No. 3	64·0	180	Cleveland	64·4
169	Florence	66·2	181	Tarragon	67·2
Class 947 (Special Prize for Yandilla King).					
182	Yandilla King	64·0	186	Yandilla King	68·1
183	,, ,,	64·6	188	,, ,,	65·7
184	,, ,,	61·8	189	,, ,,	64·0
185	,, ,,	63·7	190	,, ,,	63·5
Class 948 (Special Prize for Federation).					
191	Federation	64·0	197	Federation	66·2
192	,,	65·5	198	,,	64·8
193	,,	66·4	199	,,	66·2
194	,,	65·0	200	,,	65·0
195	,,	66 2	201	,,	65·5
196	,,	65·9			
Class 949 (Special Prize for Hard Federation).					
202	Hard Federation	66·1	207	Hard Federation	64·8
203	,,	66·8	208	,,	66·8
204	,,	66·6	209	,,	67·2
206	,,	67·5	210	,,	64·6
Class 950 (Weak Flour).					
211	Penny	65·0	220	Lotz	65·0
213	Currawa	68·7	221	Jade	65·5
214	Jade	67·4	222	Currawa	66·1
215	Major	64·4	223	Warren	65·7
216	Ortliff's Bungawannah	65·1	224	Purple Straw	67·2
217	Viking	67·5	225	Warren	68·1
218	Currawa	67·0	226	Canberra	65·0
219	Jade	67·0			

RESULTS OF MILLING TESTS.

Catalogue No.	Appearance of Grain.	Weight per bushel.	Ease of Milling.	Percentage of Flour.	Colour of Flour	Percentage of dry Gluten.	Strength.	Total.
Maximum Marks.	10	15	10	10	15	20	20	100
Class 944 (Strong Red).								
139	10	*[67·0]* 14	8	*[70·6]* 8	15	*[13·7]* 17	*[52·6]* 18	90
142	10	*[69·6]* 15	8	*[72·0]* 9	15	*[10·9]* 14	*[52·8]* 18	89
141	9	*[67·4]* 14	8	*[73·7]* 10	14	*[12·7]* 16	*[51·8]* 17	88
143	9	*[66·8]* 14	8	*[70·6]* 8	14	*[13·4]* 16	*[46·8]* 14	83
Class 945 (Australian Strong White).								
155	9	*[68·9]* 15	8	*[72·5]* 10	15	*[11·8]* 15	*[52·0]* 17	89
149	9	*[68·1]* 15	8	*[73·2]* 10	14	*[11·2]* 14	*[53·6]* 18	88
156	10	*[69·0]* 15	8	*[70·0]* 7	13	*[8·5]* 11	*[52·4]* 17	81
Class 946 (Medium Strong).								
179	10	*[68·7]* 15	10	*[74·0]* 10	13	*[12·9]* 16	*[47·2]* 15	89
173	9	*[66·4]* 14	10	*[71·1]* 8	15	*[10·3]* 13	*[47·0]* 15	84
178	8	*[67·5]* 14	10	*[69·7]* 7	14	*[12·1]* 15	*[46·0]* 14	82
163	6	*[64·4]* 12	10	*[70·4]* 8	15	*[12·6]* 16	*[46·0]* 14	81
160	8	*[67·4]* 14	10	*[69·3]* 7	13	*[11·6]* 14	*[46·0]* 14	80
171	10	*[67·9]* 15	10	*[70·0]* 7	14	*[9·0]* 12	*[44·0]* 12	80
176	9	*[65·0]* 13	10	*[70·0]* 7	15	*[10·4]* 13	*[45·0]* 13	80
Class 947 (Special Yandilla King).								
186	10	*[67·9]* 15	10	*[70·0]* 7	14	*[9·0]* 12	*[44·0]* 12	80
Class 948 (Ordinary Federation).								
197	10	*[66·2]* 13	10	*[70·8]* 8	15	*[9·8]* 13	*[44·8]* 13	82
196	10	*[65·0]* 13	10	*[69·9]* 7	15	*[9·0]* 12	*[44·2]* 13	80
Class 949 (Hard Federation).								
206	10	*[67·5]* 14	10	*[71·6]* 9	15	*[12·0]* 15	*[46·8]* 14	87
204	10	*[66·6]* 14	10	*[71·1]* 9	15	*[11·6]* 14	*[46·0]* 14	86

RESULTS OF MILLING TESTS—*continued.*

Catalogue No.	Appearance of Grain.	Weight per bushel.	Ease of Milling.	Percentage of Flour.	Colour of Flour.	Percentage of dry Gluten.	Strength.	Total.
Maximum Marks.	**10**	**15**	**10**	**10**	**15**	**20**	**20**	**100**
			Class 950 (Weak Flour Wheats).					
225	9	*[68·1]* 15	10	*[73·3]* 10	13	*[10·7]* 14	*[45·0]* 13	84
224	10	*[67·2]* 14	10	*[71·9]* 9	15	*[8·1]* 11	*[43·0]* 12	81
219	10	*[67·0]* 14	10	*[70·8]* 8	13	*[10·8]* 14	*[43·2]* 12	81
218	9	*[67·0]* 14	10	*[71·1]* 9	15	*[7·3]* 11	*[43·6]* 13	80
216	7	*[65·1]* 13	10	*[72·7]* 10	15	*[9·0]* 12	*[43·2]* 12	79
217	8	*[67·5]* 14	10	*[70·4]* 8	14	*[7·8]* 11	*[43·8]* 12	77

RESULTS OF EXAMINATION OF THE WHEATS IN CLASSES WHICH WERE NOT SUBJECTED TO THE MILLING TEST.

Catalogue No.	Variety.	Weight per bushel.	Weight Points.	Appearance of Grain.	Trueness to Type.	Uniformity.	Total.
	Maximum Points.	—	**15**	**10**	**10**	**10**	**45**
			Class 943 (Macaroni Wheats).				
126	Indian Runner ...	65·1	13	8	9	8	38
127	Huguenot ...	65·0	13	8	9	9	39
128	Indian Runner ...	64·6	13	10	10	10	43
129	Kubanka... ...	66·6	14	9	9	10	42
130	Medeah	65·4	13	9	10	9	41
131	Kubanka... ...	Not true to type.					
132	Farrer's Durum...	62·2	11	8	10	10	39
			Class 951 (Collection of Five Farrer Wheats).				
227	Bayah	66·8	14	10	10	10	44
	Cedar	67·0	14	10	10	10	44
	Comeback ...	67·7	14	10	10	10	44
	Federation ...	65·9	13	10	10	10	43
	Jade	66·8	14	9	9	9	41
							216
228	Cedar	66·2	13	10	10	10	43
	Comeback ...	67·7	14	10	10	10	44
	Federation ...	66·2	13	10	10	10	43
	Florence	66·2	13	10	10	10	43
	Jade	66·8	14	10	10	10	44
							217

RESULTS OF EXAMINATION OF WHEATS—*continued.*

	Variety.	Weight per bushel.	Weight Points.	Appearance of Grain.	Trueness to Type.	Uniformity.	Total.
	Maximum Points.	—	15	1	10	10	45
	Class 951 (Collection of Five Farrer Wheats)—*continued.*						
229	Bunyip	64·4	12	8	8	8	36
	Comeback ...	67·0	14	9	8	8	39
	Cumberland ...	65·1	13	9	9	9	40
	Rymer	65·1	13	10	10	10	43
	Tarragon ...	65·3	13	9	9	9	40
							198
230	Bayah	67·7	14	10	10	10	44
	Bobs	66·2	13	8	8	8	37
	Comeback ...	66·6	14	8	8	9	39
	Federation ...	67·7	14	9	9	9	41
	Florence	66·8	14	9	9	9	41
							202
	Class 952 (Collection of Non-Farrer Wheats).						
232	Currawa	66·2	13	9	10	9	41
	Prelude	66·4	14	8	10	9	41
	Redwing... ...	65·7	13	10	10	10	43
	Steinwedel ...	66 6	14	8	9	9	40
	Warden	65·5	13	8	9	9	39
							204
233	Currawa	66·6	14	8	9	8	39
	Punjab type 9 ...	67 0	14	7	9	8	38
	Pusa 4	66·6	14	9	9	9	41
	Pusa 107... ...	67·2	14	9	9	9	41
	Pusa 110... ...	67·4	14	9	9	8	40
							199
234	Major	65·7	13	9	10	10	42
	Marquis	66·6	14	10	10	10	44
	Marshall's 3 ...	65·0	13	8	9	8	38
	Roseworthy ...	66·4	14	9	9	9	41
	Yandilla King ...	65·1	13	9	9	8	39
							204

Awards.

Class 943—

Macaroni.

First Prize, No. 128—M. J. D'Arcy; Indian Runner; grown at Berrigan, N.S.W., on red loam; seed per acre, 39lb.; yield per acre, 15 bushels; rainfall during growth, 14 inches; fallow.

Second Prize, No. 129—M J. D'Arcy; Kubanka; grown at Berrigan, N.S.W., on red loam; seed per acre, 39lb.; yield per acre, 14½ bushels; rainfall during growth, 14 inches; fallow.

Awards— *continued.*

Class 944— Strong Red.	First Prize, No. 139—D. & J. Gagie; Cedar; grown at Spy Hill, West Wyalong, N.S.W., on sandy loam; seed per acre, 45lb.; yield per acre, 18 bushels; rainfall during growth, 7·69 inches; fallow. Second Prize, No. 142—W. H. Scholz; Cedar; grown at Gilgandra, N.S.W., on sandy loam; seed per acre, 30lb.; yield per acre, 12 bushels; rainfall during growth, 4·50 inches; autumn ploughing.
Class 945— Strong White.	First Prize, No. 155—John Ryan; Comeback; grown at Loombah, Wellington, N.S.W., on red soil; seed per acre, 45lb.; yield per acre, 21 bushels; rainfall during growth, 4 inches; fallow. Second Prize, No. 149—D. & J. Gagie; Comeback; grown at Spy Hill, West Wyalong, N.S.W., on sandy loam; seed per acre, 45 lb.; yield per acre, 21 bushels; rainfall during growth, 7·69 inches; fallow.
Class 946— Medium Strong.	First Prize, No 179—W. H. Scholz; Florence; grown at Gilgandra, N.S.W., on sandy loam; seed per acre, 30 lb.; yield per acre, 13 bushels; rainfall during growth, 4·50 inches; autumn ploughing. Second Prize, No. 173—R. Penfold; Canberra; grown at Barmedman, N.S.W., on red clay loam; seed per acre, 40 lb.; yield per acre, 18 bushels; rainfall during growth, 6·61 inches; fallow.
Class 947— Special Prize, Yandilla King.	No. 186—A. R. Michael; grown at Woomelang, Vic., on heavy soil; seed per acre, 40 lb.; yield per acre, 20 bushels; rainfall during growth, 6·75 inches; fallow.
Class 948— Special Prize, Federation. (Ordinary).	No. 197—A. R. Michael, grown at Woomelang, Vic., on heavy soil; seed per acre, 40 lb.; yield per acre, 20 bushels; rainfall during growth, 6·75 inches; fallow.
Class 949— Special Prize, Federation. (Hard).	No. 206—R. Penfold; grown at Barmedman, N.S.W., on red clay loam; seed per acre, 40 lb.; yield per acre, 20 bushels; rainfall during growth, 6·61 inches; fallow.
Class 950— Weak Flour.	First Prize, No. 225—W. H. Scholz: Warren; grown at Gilgandra, N.S.W., on sandy loam; seed per acre, 30 lb.; yield per acre, 14 bushels; rainfall during growth, 4·50 inches; autumn ploughing. Equal Second Prize, No. 219—D. & J. Gagie; Jade; grown at Spy Hill, West Wyalong, N.S.W., on sandy loam; seed per acre, 45 lb.; yield per acre, 15 bushels; rainfall during growth, 7·50 inches; fallow. Equal Second Prize, No. 224—Daniel Ryan; Purple Straw; grown at Wellington, N.S.W., on loamy soil; seed per acre, 60 lb.; yield per acre, 30 bushels; rainfall during growth, 7·40 inches; fallow.
Class 951— Special Prizes, Five "Farrer" Wheats.	First Prize, No. 228—D. & J. Gagie; Cedar, Comeback, Florence, Jade and Federation; grown at Spy Hill, West Wyalong, N.S.W., on sandy loam; seed per acre, 45 lb.; yield per acre: Cedar, 18 bushels; Comeback, 21 bushels; Florence, 24 bushels; Jade, 15 bushels; Federation, 20 bushels; rainfall during growth: Cedar and Comeback, 7·69 inches; Florence, Jade and Federation, 7·20 inches; fallow. Second Prize, No. 227—M. J. D'Arcy; Cedar, Comeback, Federation, Jade and Bayah; grown at Berrigan, N.S.W., on red loam; seed per acre: Cedar and Comeback, 39 lb.; Federation and Jade, 40 lb.; Bayah, 50 lb.; yield per acre: Cedar, 16 bushels; Comeback, 16½ bushels; Federation, 22 bushels; Jade, 20 bushels; Bayah, 15 bushels; rainfall during growth, 14 inches; fallow.

Awards—*continued.*

Class 952— Special Prize, Five Non-Farrer Wheats.	Equal First Prize, No. 232—D. A. Rich; Redwing, Currawa, Prelude, Steinwedel and Warden; grown at Wellington, N.S.W.; Redwing, Currawa, Steinwedel and Warden on red soil, and Prelude on gravelly soil; seed per acre: Redwing, Currawa, Steinwedel and Warden, 45 lb.; Prelude, 30 lb.; yield per acre: Redwing, 36 bushels; Currawa; 24 bushels; Prelude, 8 bushels; Steinwedel, 28 bushels; Warden, 21 bushels; rainfall during growth: Redwing, Currawa, Steinwedel and Warden, 7·14 inches; fallow; Prelude, 6·14 inches; autumn ploughing. Equal First Prize, No. 234—R H. Thackeray; Marshall's No. 3, Roseworthy, Yandilla King, Marquis and Major; grown at Young, N.S.W., on sandy loam; seed per acre, 50 lb.; yield per acre: Marshall's No. 3, 20 bushels; Roseworthy, 21 bushels; Yandilla King, 22½ bushels; Marquis, 15 bushels; Major, 19½ bushels; rainfall during growth, 8·40 inches; fallow.
Class 952a— Special Prizes. Wheat, viz.:— Grain and Ears.	First Prize, No. 235—Sir Joseph H Carruthers. Second Prize, No. 236—M. J. D'Arcy. Third Prize—Not awarded.

ELEPHANT GRASS DURING A DROUGHT PERIOD AT HAWKESBURY AGRICULTURAL COLLEGE.

Mr. W. M. DILL-MACKY, Experimentalist at Hawkesbury Agricultural College, in a current report, remarks that notwithstanding the extremely dry conditions which prevailed almost throughout the entire season, the Elephant grass has made remarkable growth, and by its phenomenal display has still further proved itself to be a wonderfully drought-resistant plant. The palatability tests had the same satisfactory results as those carried out during the previous season, and there is now no doubt that the stock appreciate the fodder immensely, especially the young growth. As the plant matures it becomes more or less coarse. However, the coarse material may be safely fed as chaff, and there will be very little or no waste at all. On 23rd August last year several roots were planted. They all grew luxuriantly, in spite of the dryness, and by the 27th February this year stood from 3 feet to 5 feet high. At present (20th May) the tall plants stand 9 feet; all have stooled well, the stalks numbering from forty to sixty per clump. On the 10th March this year an additional acre was planted for the use of the dairy, partly from roots and partly from cuttings. There is no doubt that the roots become established very much quicker than cuttings, but it is thought that clumps derived from cuttings are larger if not better than those derived from roots.

On the original plot, a good average size clump was allowed to grow right through the season. This attained a height of 10 feet, and when cut weighed 54½ lb. Allowing that approximately 1225 such clumps will occupy an acre, planted 6 feet apart each way, this weight would represent an approximate yield of 29½ tons per acre.

The rainfall from August, 1918, to the end of April, 1919, which embraced the growing period, was 755 points, most of which was distributed in light showers of only a few points at a time. The rainfall for the twelve months ending 1st May, 1919, was 998½ points—the driest in the history of the College.

A New Variety of Buckwheat.

TEST AT HAWKESBURY AGRICULTURAL COLLEGE.

W. M. DILL-MACKY, Experimentalist.

A SMALL quantity of a new variety of buckwheat (*Fogopyrum esculentum*) was received by the Principal, in 1918, from Mr. Bechtel, of the Department of Agriculture, Brisbane. The buckwheat was originally obtained from Egypt, and is called "Sarragin." In order to test its characteristics it was sown on 14th October last in six drills, each of which measured 3 chains long, and were spaced 27 inches apart. The balance of the plot was broadcasted with Japanese buckwheat, which in the past has proved the most suitable variety at the College.

Sarragin buckwheat is reputed to possess the following characteristics :—

1. It flowers in six weeks after germination.
2. It grows very rapidly.
3. Flowers very freely and abundantly.
4. Is especially suitable for bees as nectar producer.

The new variety germinated well, and the plants commenced to bloom on 8th November, continuing approximately for five weeks. The seed was harvested on 16th December.

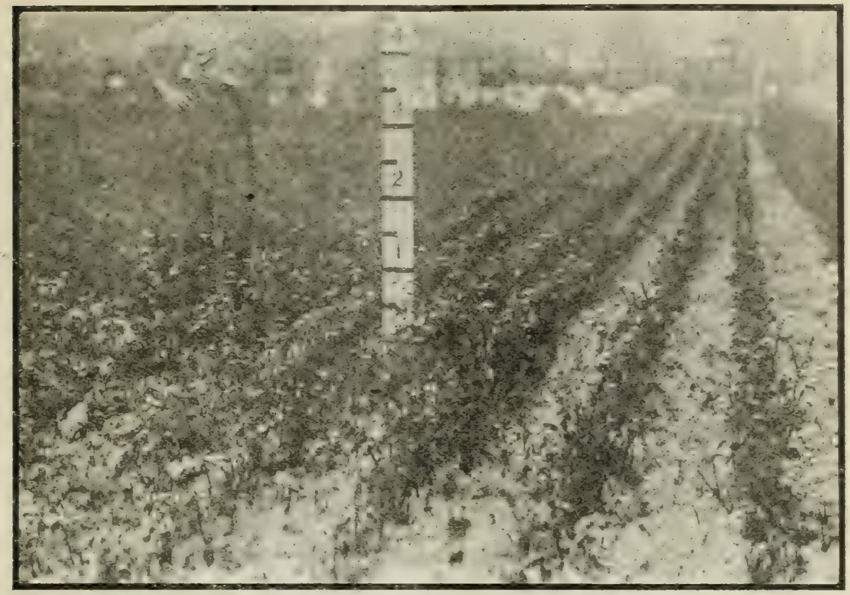
During the growing period extremely dry conditions prevailed, and this, doubtless, caused it to ripen much more quickly than would have been the case in a normal season.

Half the plot was irrigated at intervals from the 20th November, and the irrigated portion attained a height of 2½ feet at maturity, whilst the other was only 15 to 18 inches high. The accompanying illustrations afford ample evidence of the value of irrigation, the growth being not only taller but more vigorous and abundant.

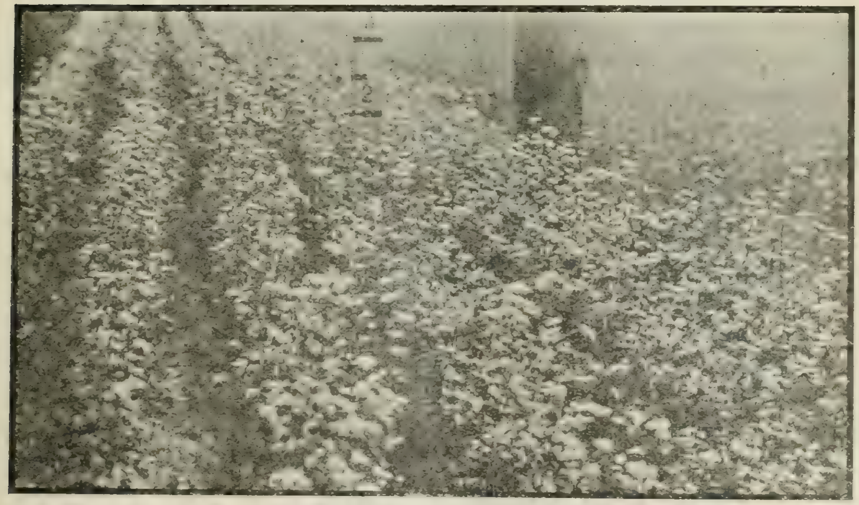
Sarragin is somewhat like the variety known as Silver Hull, and the seed is very much smaller than that of Japanese.

The College Apiarist reports that during the five weeks the Sarragin was in bloom, the bees were very active gathering nectar from its blossoms from daybreak until noon. With favourable conditions this variety should prove more valuable than Japanese as a bee plant. Buckwheat is of no value as a pollen producer.

The seed harvested will be used on a larger scale during the coming season, but none is available for distribution.



"Sarragin" Buckwheat—unirrigated.



"Sarragin" Buckwheat—irrigated.

A New Variety of Buckwheat. Test at Hawkesbury Agricultural College.

Popular Descriptions of Grasses.

[Continued from page 186.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE UNCULTIVATED PANIC GRASSES.

THE most important Panic grasses found in native pastures are :—

Panicum divaricatissimum (Umbrella or Spider grass).
P. leucophæum (Cotton Panic grass).
P. effusum.
P. gracile (Slender Panic grass).
P. Benthami (Coolabah grass).
P. distachyum.

UMBRELLA OR SPIDER GRASS (*Panicum divaricatissimum*). (Fig. 1.)

This is probably the commonest and most widely distributed of all the Panic grasses, but differs strikingly in habit in different situations. In the coastal districts it usually only has a slightly hairy appearance, while in the interior the densely hairy form is perhaps the commonest. This grass will grow in almost any situation, and it may be seen growing in pure sand in the Narrabri district. On the tablelands the root system remains dormant in the winter, but the grass comes on early in the spring.

Umbrella grass can readily be distinguished by its seed heads, which are easily broken away and borne along by the wind. It is a common occurrence to find these seed heads piled up against the fences in the interior. Owing to the shape of its flowering panicle the grass is often called Umbrella grass.

This grass cannot be specially recommended for cultivation. It is rather small in stature, and its inflorescence is so large and rigid that the touch is somewhat unpleasant to any stock that may feel inclined to graze on it.

The hairiness of the western plant is very much against it. The leaves have a decidedly velvety appearance, and are uninviting to stock when other grasses are present. It is this hairiness that helps to render this grass so drought-resistant, and combined with this is the extra protection provided the plant by hairs and sheathing leaves. The drought resistance of Umbrella grass is perhaps greater than that of any other Panic grass. During the remarkable Riverina drought of 1914 it was one of the last to lose its verdure. For this reason it is certainly a desirable grass to have in a pasture, although not worth the trouble of cultivation.

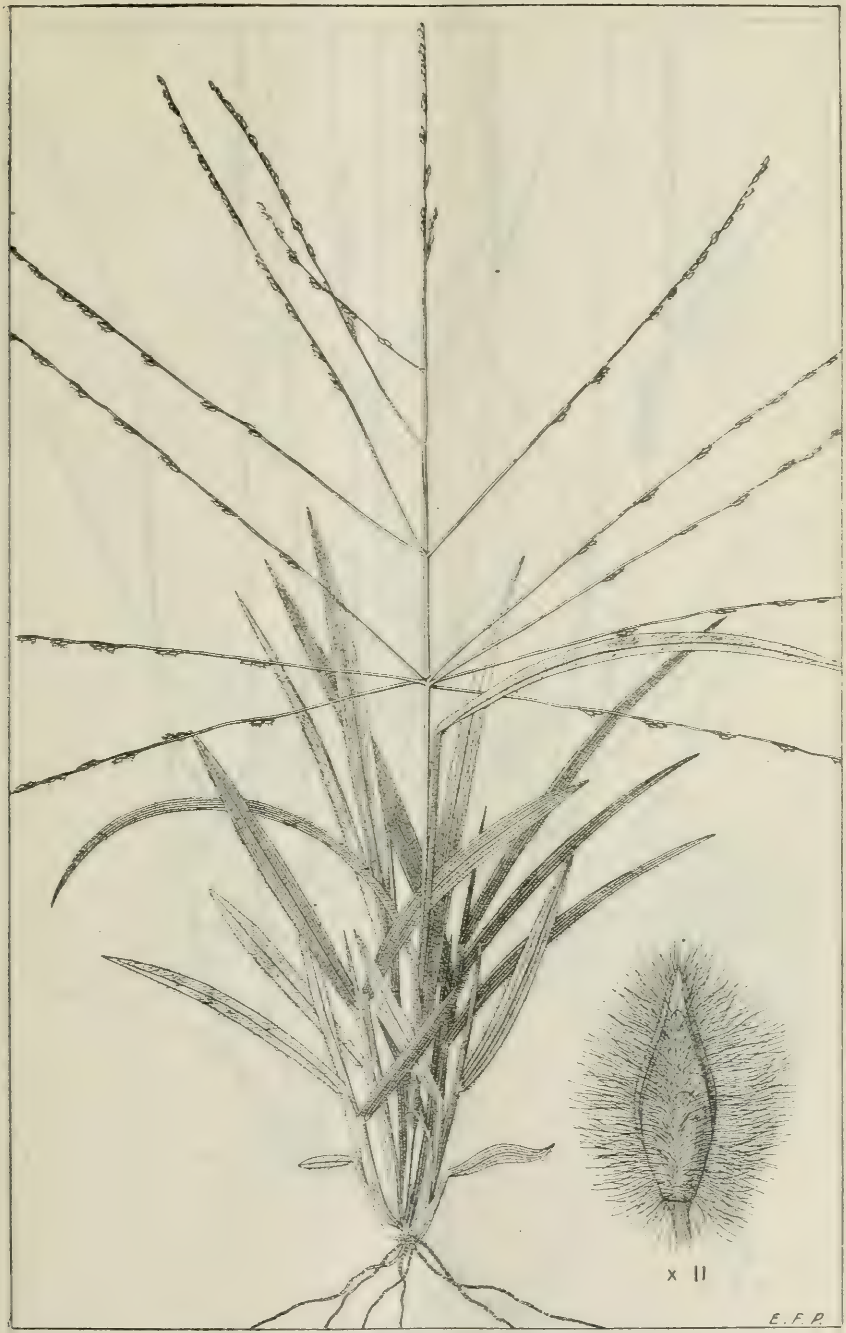


Fig. 1.—Umbrella or Spider Grass (*Panicum divaricatissimum*).

This is the form common on the western and north-western soils. Note the hairiness of the leaves—a distinct objection as to palatability, though rendering the grass extremely drought-resistant.

POPULAR DESCRIPTIONS OF GRASSES.

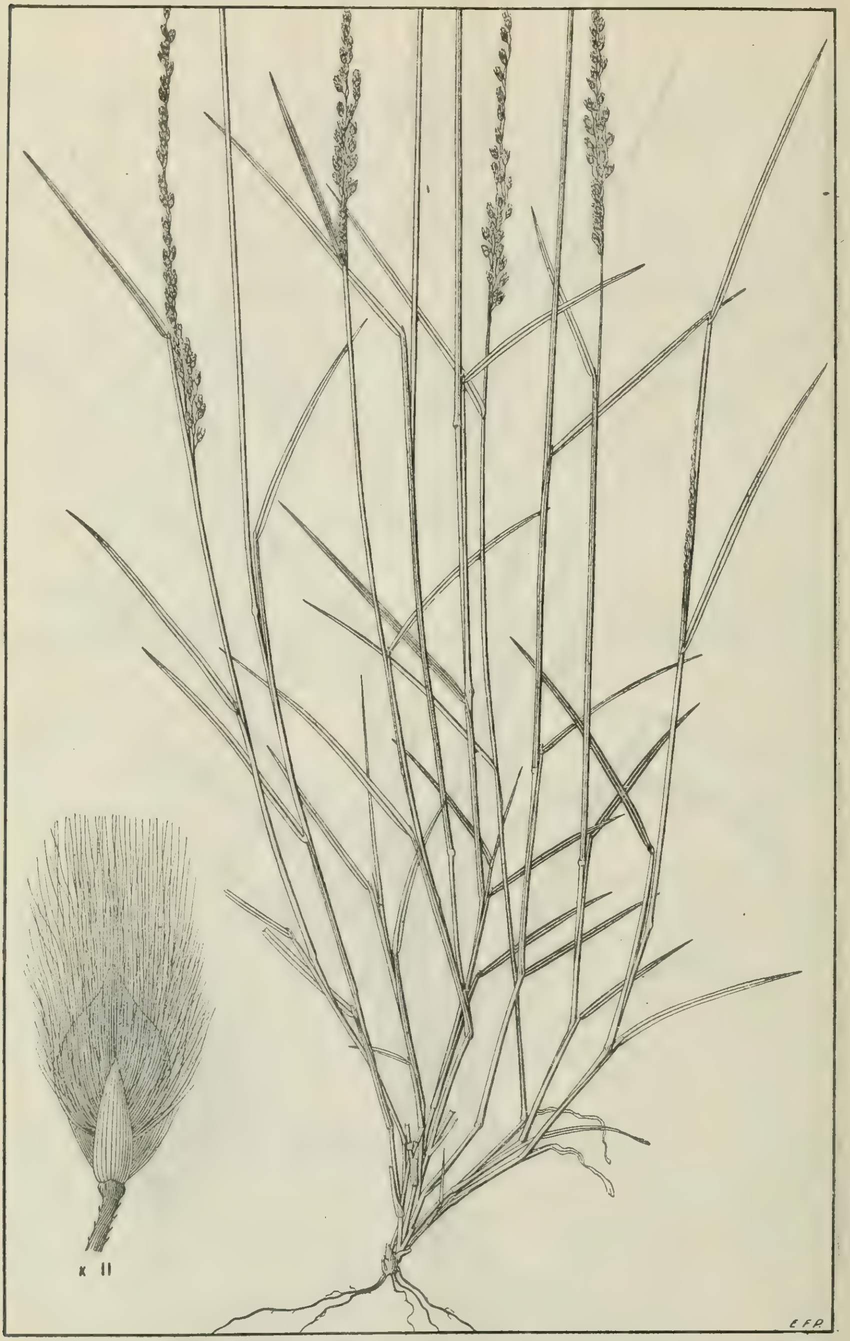


Fig. 2.—Cotton Panic Grass (*Panicum leucophæum*).

Note the slender root system. The grass is not a drought-resister, but it is very palatable.

POPULAR DESCRIPTIONS OF GRASSES.

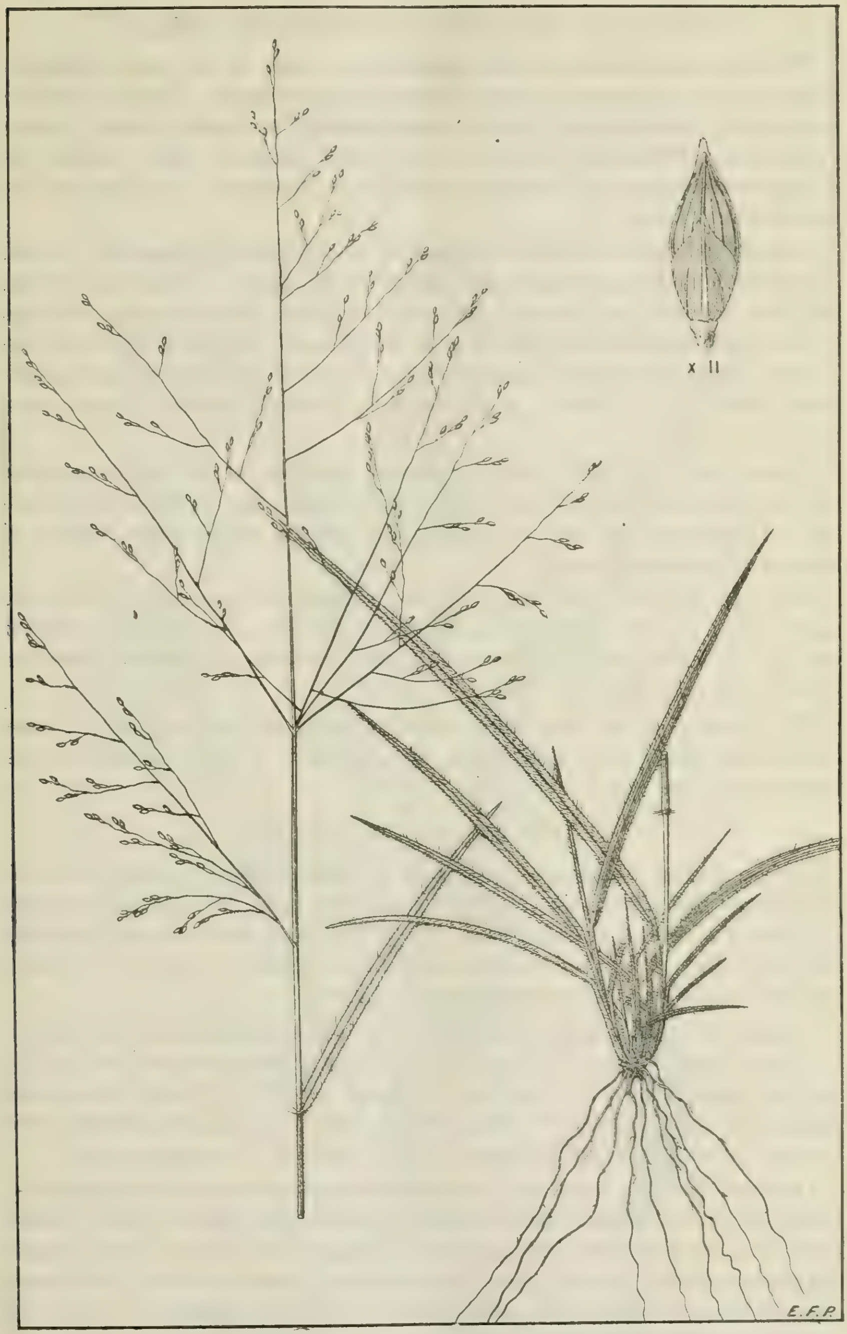


Fig. 3.—*Panicum effusum.*

This is the typical form on the coast and tablelands. Note the hairy leaves.

POPULAR DESCRIPTIONS OF GRASSES.

COTTON PANIC GRASS (*Panicum leucophæum*). (Fig. 2.)

This grass can readily be distinguished, as a rule, by its hairy spikelets, which in the western plant have a glistening appearance. The hairs on the spikelets are sometimes of a wine shade, giving the plant a rather pretty appearance. Sometimes, however, the plant becomes very similar to *P. divaricatissimum,* and it is then difficult to determine the difference by the seed-head alone.

Cotton Panic grass is mostly confined to the interior, being sparingly found on the tablelands, and practically absent on the coast. It is found in all the States as well as in Tropical Africa and America. In the western districts it is commoner on the red than on the black soils. On the red soils in the Nyngan district two forms appear to exist, viz., a wide-leafed and a narrow-leafed form. The former is much larger and more vigorous in habit than the latter.

Cotton Panic is a good drought-resistant grass as far as the root system is concerned, although the flag soon withers under the influence of the hot sun. The base of the stem is swollen, and covered with a dense coating of hairs and sheathing leaves.

The grass does not come well into growth until the approach of the warm spring rains. As far as can be gathered, it provides good feed, and were it not for its ephemeral character would be considered a desirable grass to place under cultivation.

The flower stalks of this grass are not so easily broken away as are those of Umbrella grass, and consequently it is confined to more restricted areas than is the latter grass.

Panicum effusum. (Fig. 3.)

This is a grass somewhat resembling *P. decompositum* in stem and leaf appearance, but very inferior to that grass both in growth and palatability. It is more widely distributed than *P. decompositum,* being found in all the States. It also often dominates the situation in many places on the coast and tablelands, where *P. decompositum* is absent.

It is partial to all classes of soils, being found on the clay soils of the County of Cumberland, on the schists and slates of the southern slopes, and on the red and black soils of the interior. Although sensitive to frosts, it recovers much more quickly than *P. decompositum,* and its abundant presence may be noted in all sorts of situations on the tablelands in the spring months.

This grass is a very hairy one, and stunted in appearance in most situations. Even on the best alluvial soils it seldom grows higher than a couple of feet. Its hairiness is a strong objection from a fodder point of view; and although the grass is readily eaten by sheep in the interior, it cannot be put in the same category as *P. decompositum* and other good fodder grasses. It may be considered a good drought-resistant grass, and in this respect its utility on the harder and poorer class of soils is unquestionable.

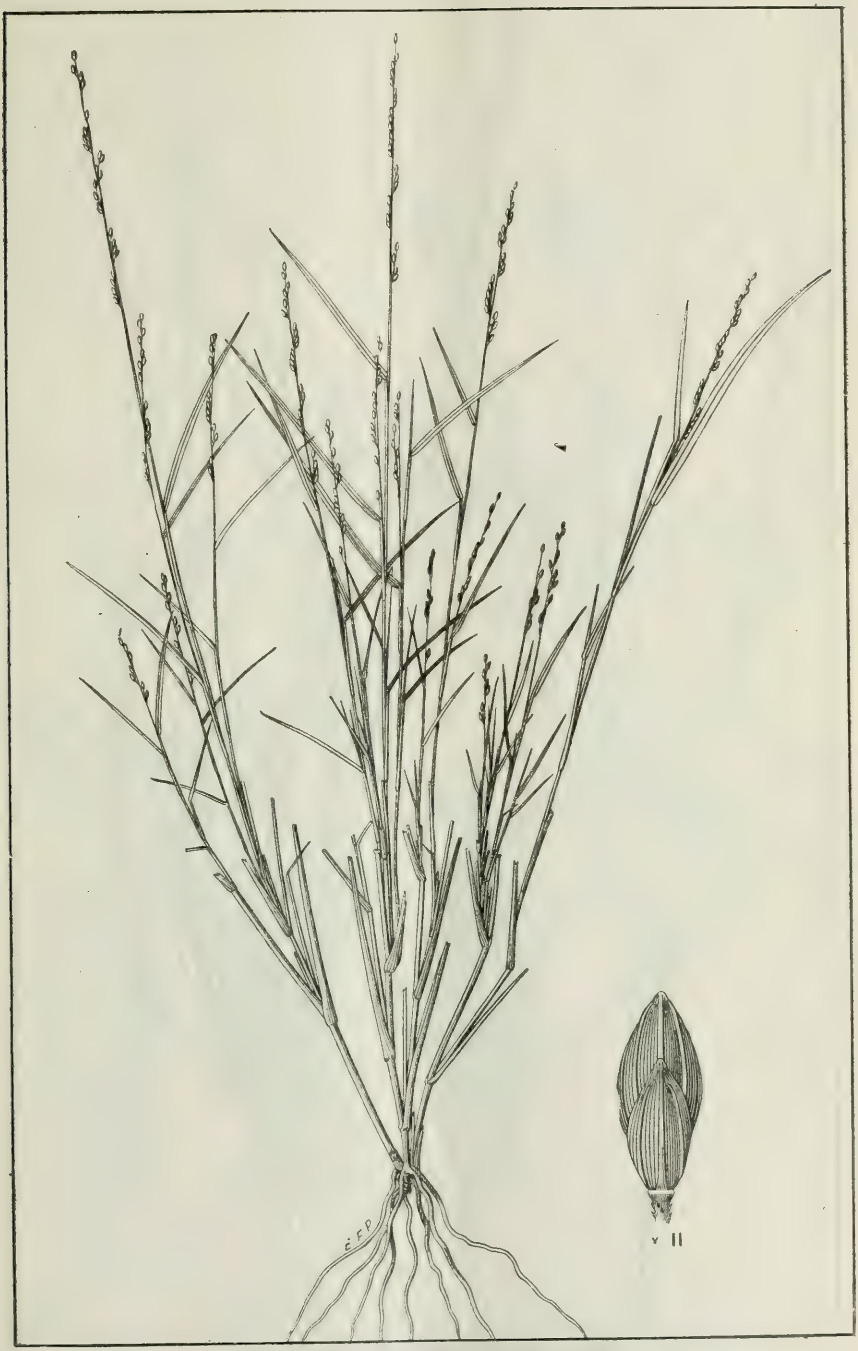


Fig. 4.—Slender Panic Grass (*Panicum gracile*).
Note the resemblance of this variety to Warrego Summer grass (*Panicum flavidum*). The flowering spikelets are arranged much more irregularly, however, in this case than in that.

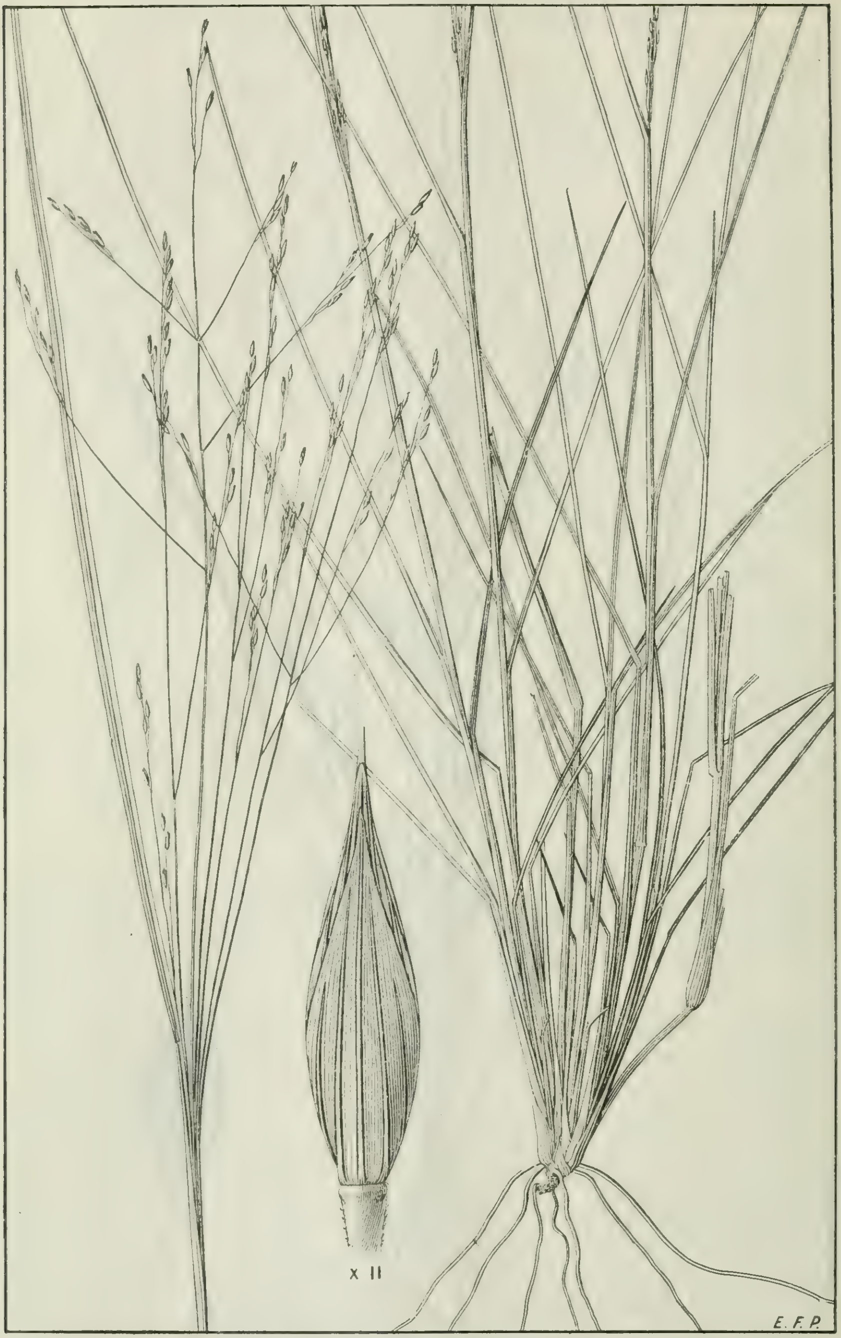


Fig. 5.—Coolabah Grass (*Panicum Benthami*).

Very common on the New England Tableland and the Black Soil Plains. A remarkably drought-resistant grass.

POPULAR DESCRIPTIONS OF GRASSES.

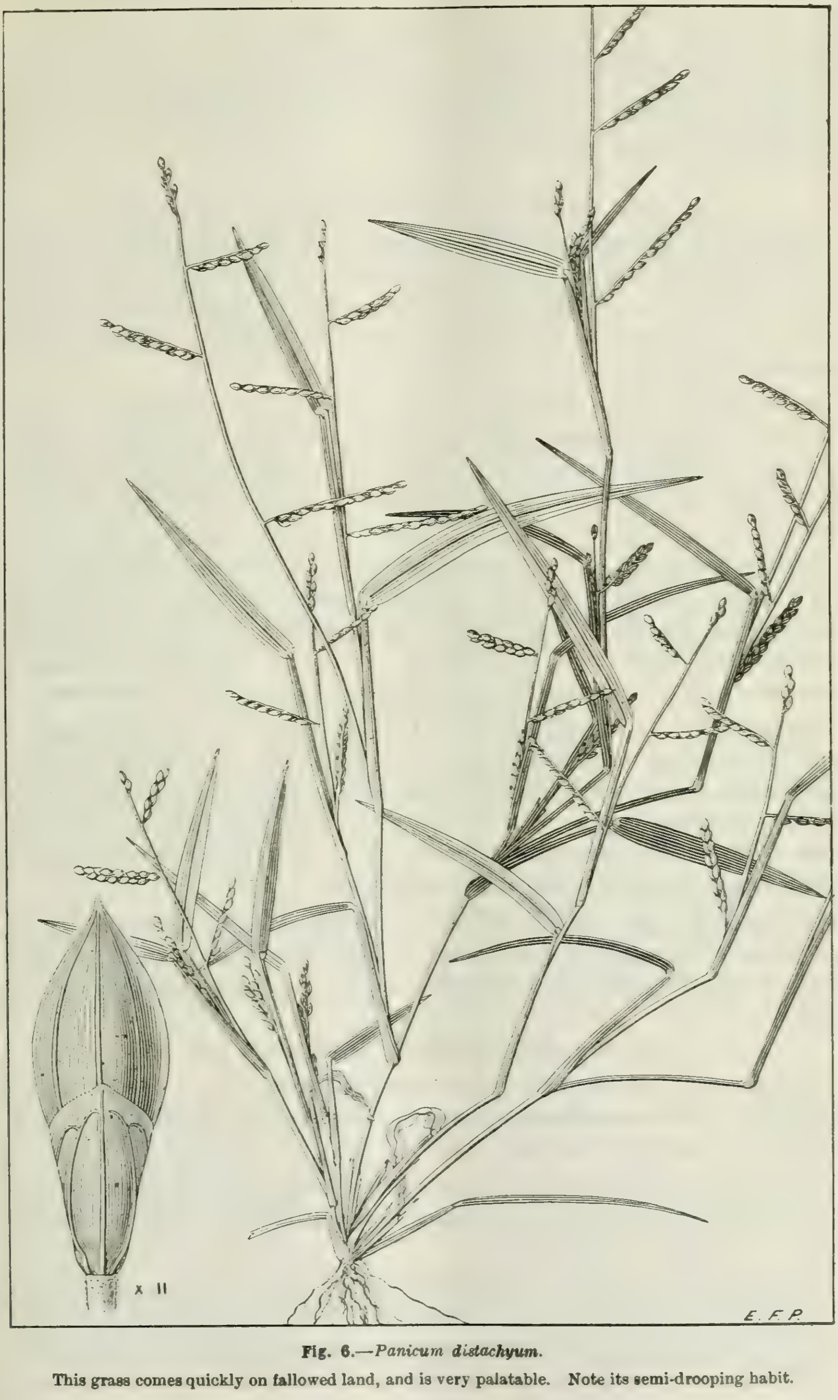


Fig. 6.—*Panicum distachyum.*

This grass comes quickly on fallowed land, and is very palatable. Note its semi-drooping habit.

POPULAR DESCRIPTIONS OF GRASSES.

In the western districts the grass differs very much in habit and appearance from that on the coast and tablelands. In the interior its leaves are a very glaucous green, and its root system also resembles *P. decompositum* in being vigorous but shallow. The grass is a very heavy seeder, but the seed is not of a good germinating quality.

SLENDER PANIC GRASS (*Panicum gracile*). (Fig. 4.)

This grass is admirably adapted to all classes of soils, being found on sandstone and clay soils as well as on the richer alluvial and volcanic formations. It is perhaps more abundant in the interior western districts, but it is no uncommon sight on the Hawkesbury, Permo-carboniferous, or the Tertiary sandstones of the coast.

As a rule, this grass can easily be recognised by the arrangement of the seeds on the stalk, which are closely appressed in irregular rows to the flowering pedicels. The irregularity of the rows, and the smaller, slenderer stature of the grass generally distinguishes it from *P. flavidum* (Warrego Summer grass).

When growing under harsh conditions this grass is extremely wiry, developing a strong stalk and root system, and, if continually stocked, producing only a small amount of flag. It responds readily to good soils, and then produces very large tufts. On such soils in the interior it will form associations or areas of considerable size, and will often crowd out other grasses.

On the hard soils the persistency of the root system is somewhat remarkable, and although in such cases the stem of the plant is wiry, this vigorous root system enables the plant to maintain a fairly leafy growth, which provides constant picking for the sheep, even in drought periods. The seed must be of a good germinating quality, as on fallowed lands it is a plant which stands out prominently in the early spring.

On account of its palatability, its drought-resistance, its adaptability to all classes of soils, and its occurrence in large quantities, even in heavily-stocked areas, this grass must be considered one of our most valuable western grasses.

COOLABAH GRASS (*Panicum Benthami*). (Fig. 5.)

This grass was previously confused with *P. trachyrachis.* It can be distinguished by the tapering seed glumes, and by the large outer glume, which is nearly as large as the ordinary glumes.

Coolabah grass is fairly common in the New England and Inverell districts during the summer months, very common in the Moree district, and rather rare in the western districts.

Some pastoralists speak very highly of this grass, and during the severe drought of 1914 it was one of the few to hold out in the north-west. Its flag is somewhat harsher than that of most Panic grasses, but there is no doubt about its palatability, and it appears to stand a fair amount of stocking.

Panicum distachyum. (Fig. 6.)

This is an interior grass, rather short-lived, but producing an abundant supply of nutritious feed during the short period of its existence. It has a slightly creeping habit, carries a very large amount of leaf, and has, in comparison with most Panic grasses, a very small amount of inflorescence. It does not grow to the same height as other Panic grasses.

Panicum distachyum will be found in low situations on the western plains, and it is also fairly common on fallowed lands. Its succulence and palatability are of a high order. It is very sensitive to frosts, and it is only on the approach of summer rains that it makes any growth.

ORDERS FOR GRAFTED RESISTANT VINES.

ORDERS have been received by the Department for large numbers of wine varieties of grapes grafted on resistant stocks, but considerable quantities can still be supplied, and growers are invited to communicate their requirements at an early date. The number available of each of the standard resistant stocks is shown in the following table, but it should be understood that orders are being continually received, so that the quantities are subject to reduction, and it would be well to state an order of preference in indicating requirements.

VINES ON PHYLLOXERA-RESISTANT STOCKS.

Variety.	Number available.	Variety.	Number available.
Black Hamburgh on M x R 1202	1,743	Gordo Blanco on C x B 41 B	3,041
,, ,, on R x C-R 106·8	5,925	,, ,, on M x R 1202	1,279
,, ,, ,, (buds)	485	,, ,, V x C-R 62-66	1,476
,, ,, on R. G. de M.	3,754	Grenache on R du Lot	810
Black Shiraz on C x B 41 B	417	,, on R x R	1,000
,, ,, on M x R 1202	8,111	Muscat Hamburgh on M x R 1202	4,400
,, ,, ,, (buds)	720	,, ,, on R x C-R 106·8	493
,, ,, on R x R 3306	4,679	,, ,, on R x R 3309	5,227
,, ,, on R x R 3309	16,323	Tokay on R x R 3309	435
Doradillo on C x R 33	2,833	White Shiraz on R x C-R 106·8	824
,, on R du Lot	625		
,, on M x R 1202	1,113		

PHYLLOXERA-RESISTANT ROOTLINGS.

Variety.	Number available.	Variety.	Number available.
Aramon x Rupestris Ganzin No. 1	7,585	Riparia x Rupestris 101·14	7,321
Cabernet x Rupestris No. 33	2,424	,, ,, 3306	16,116
Chasselas x Berlandieri 41 B	6.953	,, ,, 3309	15,618
Mourvedre x Rupestris 1202	22,087	Rupestris du Lot	2,680
Riparia x Cordifolia - Rupestris 106·8	12,752	Vinifera x Cordifolia - Rupestris 62·66	500
Riparia Gloire de Montpellier	1,773		

The prices for the grafted vines are £10 per 1,000, f.o.r., or £2 per 100, or £1 10s. per 50, rail, freight or postage paid. For the phylloxera-resistant rootlings the prices are £3 per 1,000, f.o.r., or £1 2s. 6d. per 200, 15s. per 100, or 10s. per 50, rail, freight or postage paid. Cash must accompany all orders.

Treatment of Sheep under New England Conditions.

L. JUDD, Stock Assistant, Glen Innes Experiment Farm.

For the past few years the primary producer in this and in other countries has been confronted with a steady increase in the cost of production, and at the same time with a gradual spread of disease and parasites, all combining to materially increase the running expenses and at the same time to reduce the total output of farm properties.

American farmers have shown a splendid example in adopting improved methods of agriculture and of stock management, though Australia more than holds her own in the wool section. For the solution of our own problems we must also look to improved methods of agriculture, and greater care in the handling of our own live-stock, but with these things there must also go, as essential to success, the improvement of pastures, growth of fodder crops, conservation of fodder, provision of licks, and the control of diseases and parasites.

Pastures.

The pastures of New England are capable of vast improvement. Over the greater area the grasses are sour in their natural state, and if not properly stocked they become woody and innutritious. Most of them are tussocky grasses which are far from ideal sheep feed. Exception must be made of Wallaby grass (*Danthonia semiannularis*), Blue grass (*Andropogon affinis*), and Star or Windmill grass (*Chloris truncata*), which are undoubtedly among our best native grasses.

Much may be done by judicious stocking, and this involves the avoidance of under-stocking as well as over-stocking. By preventing a too luxuriant growth the maximum efficiency may be obtained, for sheep readily eat young green shoots, but the woody fibrous growth that characterises the mature stage is unpalatable and indigestible, and is not relished by stock. In the winter the coarser grasses, such as Kangaroo grass and Wild sorghum, are absolutely useless.

Over-stocking, the other extreme, is more common, but has also to be guarded against, lest the finer and more nutritious grasses be eaten out, and the poorer and less palatable ones allowed to take possession.

While as a general rule the practice of burning off is to be deprecated, there is a good deal to be said for it as a means of improvement in seasons of rank growth. In this district the benefits were clearly seen during 1918. If burnt off, the pasture is cleared of all rubbish and old growth, and sheep are thus enabled to get the full benefit as soon as the new growth commences. It has the additional value, too, that larvæ of many internal parasites are probably destroyed at the same time.

The benefits to be derived from laying down artificial pastures have already been amply demonstrated in this and other parts of the State, and they offer a great opportunity for the improvement of the carrying capacity of New England.

Observations made and results obtained at this farm show that the following grasses may be recommended for local purposes:—Cocksfoot (*Dactylis glomerata*), *Phalaris bulbosa*, Kentucky Blue grass (*Poa pratensis*), and Perennial Rye grass (*Lolium perenne*). The native grasses, Wallaby grass (*Danthonia semiannularis*), Blue grass (*Andropogon affinis*), and Star or Windmill grass (*Chloris truncata*) are also desirable, but their seed does not germinate well enough to justify their recommendation for cultivation, though they should certainly be allowed to seed at intervals.

Cocksfoot (*Dactylis glomerata*) is relished by stock, but on account of its tussocky habit it requires to be stocked well to prevent it from becoming too coarse and woody. *Phalaris bulbosa* withstands both severe winter and dry conditions well, is a quick grower, a good stooler and frost resister, and is readily eaten by sheep. If under-stocked it is likely to make too vigorous a growth under favourable conditions. Kentucky Blue grass (*Poa pratensis*) is a good grass when established, spreading quickly and standing stocking well; it suffers under dry conditions, but springs up rapidly after rain. Perennial Rye grass (*Lolium perenne*) makes early and quick growth in the spring, germinates well, and soon establishes itself. It will stand heavy stocking in the spring, and is a valuable adjunct to any pasture, but it does not withstand dry conditions well.

From observations in the experimental plots at this farm, Tall Oat grass gives great promise. It has done remarkably well through the dry spell, and gives indication of being very hardy. It stools and resists frosts well, and has a good leafy aftermath. Whether it presents as good a performance under stocking and field conditions will be interesting to see.

When laying down a pasture the addition of a little clover and lucerne seed is highly desirable. Besides improving the feeding value, these fodder plants have a beneficial effect on the soil. Their use is governed, in a measure, however, by the market value of the seed. The following varieties of clovers and lucernes may be recommended for the district:—White clover (a perennial which, however, requires careful management), Chilian clover (a biennial), Montana lucerne, Algerian lucerne and Tamworth lucerne.

The palatability and carrying capacity of artificial pastures have been amply demonstrated here, and one of their recommendations is that they maintain stock in better condition and promote resistance to internal and other parasites.

To keep them clean, sweet and healthy, and to give them a chance to recover after stocking, pastures should be systematically spelled. Moreover, a change of pasture is always appreciated by sheep and is conducive to good health. Another point worthy of note is the fact that introduced grasses may be allowed to rest and seed without becoming coarse and useless fodder, as in the case of some natural pastures.

As to the palatability and sweetness of artificial grasses compared with native grasses I have seen the former eaten to the ground and sheep still grazing over them, while several acres of native grasses, 6 inches high, were untouched. In trials on this farm, sheep have doubled their increase in weight on the former as compared with the latter.

Although the district is not considered suitable for lucerne, the results obtained at this farm show that the yield obtained will be very fair, provided suitable varieties are grown and dressings of superphosphate are given as recommended by the Department. It is not advisable to graze lucerne continually, but a stand of this valuable fodder will more than justify its existence for grazing lambs when weaning, more especially if other green fodder is not available. It will also prove of value in tiding old ewes over a dry spell.

Fodder Crops.

There is no practice that assists more towards the increased productiveness of a property than the growing of suitable fodder crops, for sheep, like all other animals, appreciate a change of diet; nor is anything more conducive to good health and the production of milk in ewes. In catering for the fat lamb market the growing of feed is essential, for without a plentiful supply of suitable succulent feed it is impossible to raise the ideal lamb for export. The cultivation of such crops is essential, too, if the maximum returns are to be derived from crossbreds, which are certainly gross feeders, but which by their returns from the wool and mutton will repay ample feeding.

At present the practice appeals more to the mixed farmer than to the grazier, inasmuch as fodder crops may form part of a rotation. Their cultivation renovates the land, providing humus in the manure and the plant remains, and resting the pasture areas during the winter months. It is now generally accepted that the inclusion of sheep on a mixed farm is necessary to good practice. The raising of fodder crops permits of sheep being carried on farms that otherwise would be too small, so that the conversion into profitable produce of a quantity of useful fodder in stubble paddocks, &c., which would otherwise go to waste, becomes possible.

Nor can fodder crops be overlooked by the grazier. They are especially valuable as a preparatory crop in a paddock that is to be laid down as pasture, and for renovating old pasture land prior to resowing with grasses. The sheepowner who cultivates maize with a view to making silage will find the benefits of rotation with a fodder crop as great as does the mixed farmer. For topping-off wethers and old ewes for market, and as supplying succulent green feed in the winter, fodder crops are valuable, and their cultivation enables sheep to be kept in good condition and be provided with a green picking throughout the year. Fodder crops have been grown in the rotation course practised on this farm for years, and have materially increased the carrying capacity. The crops that have been found suitable to the district are wheat, oats, turnips and rape (the last on the richer soils only).

Fodder Conservation.

Even with the growing of crops, provision must be made in the event of a failure, such as was experienced in 1918. The conservation of fodder, either in the stack as hay or in the form of silage, is all important to success under our conditions.

Silage is undoubtedly the best means of averting, or at least minimising, the disastrous effects of drought. It conserves fodder with the minimum of loss, provided approved methods are adopted, and supplies a nutritious succulent fodder that is much relished by sheep at a time when such a thing is otherwise unobtainable. It has a laxative effect that is specially valuable when only dry feed is available.

Sheep may refuse to eat silage at first, but once having acquired the taste they readily clean it up. Experience here has gone to prove that the addition of a little maize and bran for the first day or two will obviate any trouble in this direction.

The keeping qualities of silage have been amply and frequently demonstrated, pits or silos opened up ten years and more after making having been found perfectly good and palatable to stock.

Maize is undoubtedly the best crop to cultivate for silage on account of the high yields obtained and the excellent sample it gives when cured.

Licks.

The value of and the part played by a lick in keeping sheep in a sound healthy condition is realised by most up-to-date sheepmen, but there are still many who fail to appreciate its necessity. The various constituents required by stock should be supplied by their pasture, but in numbers of cases certain necessary elements have proved to be lacking. Continuous stocking and over-stocking often produce a gradual deterioration in the feeding value of pastures. To a certain extent these deficiencies can be remedied by the improvement of the country and the laying down of artificial pastures, but even in such cases room is left for improvement by the provision of a suitable lick.

It is acknowledged by stockowners of repute that it pays at all times to keep an abundant supply of lick at the disposal of sheep, the extra expense incurred being more than compensated for by the increased quality and quantity of both wool and mutton. With the deterioration of pastures it is apparent that the requirements of sheep, and more especially of growing sheep, must be supplied by artificial means.

Large areas of our pastures are deficient in lime and phosphates, and unless these are supplied to young stock there must be stunted growth, weak bone, and defective constitution. The deficiencies in the pastures can be economically supplied in bonemeal or calcium phosphate.

Some of our pastures may be of a saline nature, but if so they are few and far between, and one can safely say that the requirements of sheep must be supplied from another source. Salt has a decidedly beneficial effect in increasing the appetite and acting as a stimulant to the digestive organs, thereby aiding stock in the conversion of fodder into the most profitable forms. The addition of sulphate of iron is highly desirable as it acts as a stimulant to the system.

Licks have the additional recommendation in this district that they assist the grazier to cope with worm infestations and their value in this respect has been demonstrated at this farm.

The following lick is recommended by the Department, though it is proposed to test the efficacy of other preparations in the near future:—

Liverpool salt	40 lb.
Sterilised bonemeal or calcium phosphate	5 lb.
Sulphate of iron	1 lb.

Suitable receptacles for the distribution of the lick are essential, otherwise serious losses must occur. Troughs should be made for the purpose and will be found to amply repay their cost in the waste that is avoided.

A very interesting and instructive experiment, demonstrating the beneficial effects of calcium phosphate in a lick, was carried out at this farm in connection with drenching experiments some years ago, when the wisdom of adding the calcium phosphate to the Liverpool salt and sulphate of iron under our conditions was clearly proved. It had been observed previously that sheep on the complete lick did exceptionally well—much better than sheep on the salt and sulphate of iron only—and a trial was consequently arranged extending over three months, the results of which showed that lambs supplied with the complete lick made nearly 50 per cent. greater increase in weight than lambs on a lick from which the calcium phosphate was omitted.

LIST OF PLANTS DECLARED TO BE NOXIOUS IN VARIOUS SHIRES AND MUNICIPALITIES DURING MAY, 1919.

Plant.		Shire.	Municipality.
Scientific Name.	Common Name.		
Hypericum perforatum ...	St. John's Wort ...	Abercrombie, Blaxland and Yanko.	....
Inula graveolens	Stinkwort	Yanko.	....
Lantana camara	Lantana	....	North Illawarra.
Onopordon acanthium ...	Scotch Thistle ...	....	,,
Rubus fruticosus	Blackberry... .	....	,,
Xanthium spinosum ...	Bathurst Burr ...	....	,,

Some New Varieties of Maize in New South Wales.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

ALTHOUGH it is the intention of the Department of Agriculture to strictly limit, as far as possible, the number of varieties of maize grown in this State —or at least to limit the number of varieties recommended—the work of testing new varieties of promise must proceed, in order that their value for the purpose of replacing varieties at present recommended, or for special or local climatic or soil conditions may be determined. With this object in view, a number of new varieties of maize have been recently imported from America and South Africa, which enjoy good reputations in those countries as the best under certain conditions. A brief account of these varieties, with some information concerning them from their country of origin, and the districts in this State in which they are likely to succeed, will be of interest.

Early Canada Flint.—This variety was introduced from America by Sir Joseph Carruthers in 1917, and is apparently the earliest variety of maize known to exist. It is not likely to oust any of our well-known varieties in the recognised maize districts, but is certainly a variety which will extend the area of maize-growing into districts which have hitherto been considered too cold, or to have too short a growing-season to mature any maize.

Minnesota 23.—This is a dent, or rather a semi-dent, yellow variety, which is the earliest known dent variety of maize in existence. It is only a few days later than Early Canada Flint, and is therefore likely to be suited to cold climates, where a very quick maturer is required. Being a dent variety, it has not the objectionably hard grain of the flint varieties, and it is also likely to yield better than these where it will mature. In any of the recognised maize districts of the State, even the coldest, it will mature quite easily, and it should be valuable here for later sowing, as well as being worthy of trial in any locality on the tablelands, which is considered risky at present for maize-growing, owing to the shortness of the season. It is earlier than the so-called "Ninety Day," or flint maize most commonly grown in the State.

North-western Dent.—A very early maize, with dark red grain of dull colour. It is only a few days later than Minnesota 23, and should be suitable for the tablelands and cold districts. It has also established some reputation in America as a drought-resistant variety, or at least one which has done well under semi-arid conditions, when many other varieties failed. Last season at Pallamallawa, in a test of a number of varieties during the drought, this variety was the only one from which any seed was obtained.

U.S. 133.—This is also a very early variety, with yellow grain, which matures very little later than North-western Dent, and can be grown with safety on the tablelands. It is, however, as a variety, suited to semi-arid conditions in America, which has caused it to come under notice. On dry land, or under irrigation, in the Great Plains area in the United States, it has occupied first place in yield in many tests with a large number of varieties. A very successful plot was grown on the Murrumbidgee Irrigation Area last season.

Golden Glow.—This is another very early yellow dent variety, also known as Wisconsin No. 12, being largely grown in Wisconsin and the colder States of America, and in Canada. An idea of the earliness of this and the other varieties previously mentioned may be gained from the fact that Golden Glow is a few days later than the latest of the foregoing varieties, but is nearly three weeks earlier than Early Yellow Dent, which is the earliest variety grown to any extent on the northern tableland in the recognised maize-growing centres. This variety has been tested for one season at Tenterfield, and is very promising.

Silver King is also known as Wisconsin No. 7. It is a white variety of about the same maturity as Golden Glow, and, like this variety, also largely grown in the northern States of America, and in Canada. It is likely to be also suitable for the Northern Tableland, and in common with all the foregoing varieties should mature before the extreme heat of midsummer if sown early in spring on the western slopes.

Golden Superb.—This is a medium early variety of yellow dent maize, which is largely grown on the Macleay River to mature by the end of the year and to catch a good market price before the bulk of the Northern River maize starts to come on the market. As the type of this maize was becoming lost some fresh seed of good type has been obtained from America.

Eureka.—This is a yellow maize of midseason maturity obtained from South Africa, where it is stated to have given the highest average yield over a period of five years in comparison with all other varieties obtainable. It is not thought that it will mature on the tablelands here, and is therefore recommended for trial on the coast.

Cocke's Prolific.—This variety has been previously grown in New South Wales, but mostly for fodder. It is a medium late white, hard-grained variety, with a tendency to bear two or more ears per stalk. It is most largely grown in the south-eastern States of America, where the climate is very hot and the rainfall fairly high. The ears are well protected from the weather and from insects by a good husk, and as the grain is hard also, it is highly resistant to the weevil. It is not expected to displace the main varieties recommended for the North Coast in the large maize-growing centres, but should be of value in the districts of excessive rainfall, such as the lower part of the rivers on the far North Coast.

As there is only a limited supply of seed of these new varieties, it is essential that this seed should be increased in quantity so that it can be distributed for trial in 1920. In the meantime, it is proposed to ask reliable farmers to undertake to grow an acre or so of any one of these varieties for this purpose.

Any communications in this connection should be addressed to the Under Secretary, Department of Agriculture, Sydney.

Planting Grafted Resistant Vines.

H. E. LAFFER, Viticultural Expert.

In view of the necessity for care in the planting of grafted rootlings, a few special directions for the information of those who do not know from experience the value of detail will, perhaps, be useful.

At the outset it may be said that the phylloxera-resistant vine is much more difficult to grow than the European non-resistant. This may be instanced by the facility with which cuttings of the latter grow, even when placed direct in the positions which they are to occupy in the vineyard. Although in some instances the resistant American cuttings are similarly treated, it is only in an exceptional season that results anything like satisfactory are obtained. Thus, we may say that, for practical purposes, the grower who wishes to create a vineyard on resistant stock has two alternatives:—

1. Planting bench-grafted rootlings.
2. Planting rootlings of resistant wood ungrafted, with a view to working them over with the desired varieties as they stand in the vineyard—in other words, to field-grafting.

To the unskilled grower the first method is the simplest, because it entails nothing more than careful preparation and planting of the vines, with the subsequent care in training them.

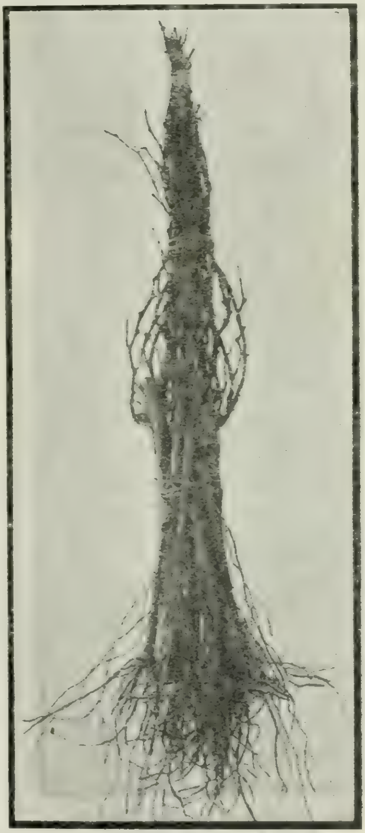


Fig. 1.—Bundle of Bench-grafted Vines.

The ungrafted rootling has much to commend it when the grower possesses the necessary skill and knowledge to graft or bud the stock in the year following the planting. The stock is either grafted in the early spring, one year after planting, with scions of the variety from which the fruit is desired, or it is "yema" budded in the autumn (February or March) succeeding the planting season. The latter operation is the simpler, and requires no special skill beyond ordinary care to ensure success. It has the advantage, too, that scions can be secured as desired from the most prolific vines, and under normal conditions of temperature they readily callus to the stock. In the following year the crown of the vine is so reduced as to force the bud into growth, and when it has assumed control the remaining portion of the resistant stock is removed. The bud makes a perfect union; and the vine will commence to bear fruit in its third year, that is, after the second year's pruning.

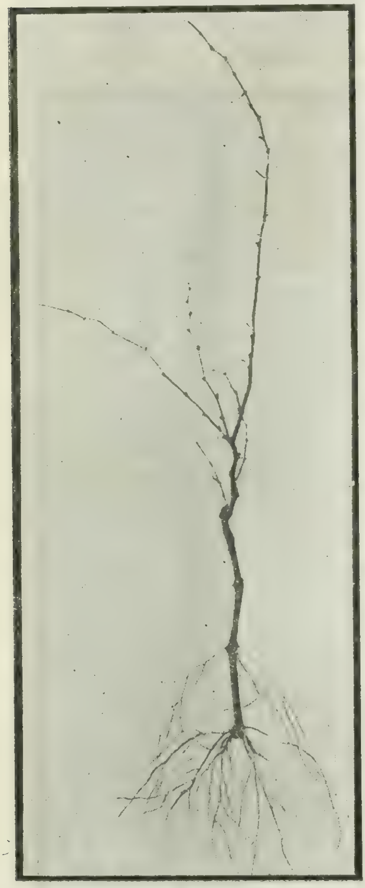


Fig. 2.—Grafted Resistant Vine, as removed from the Nursery.

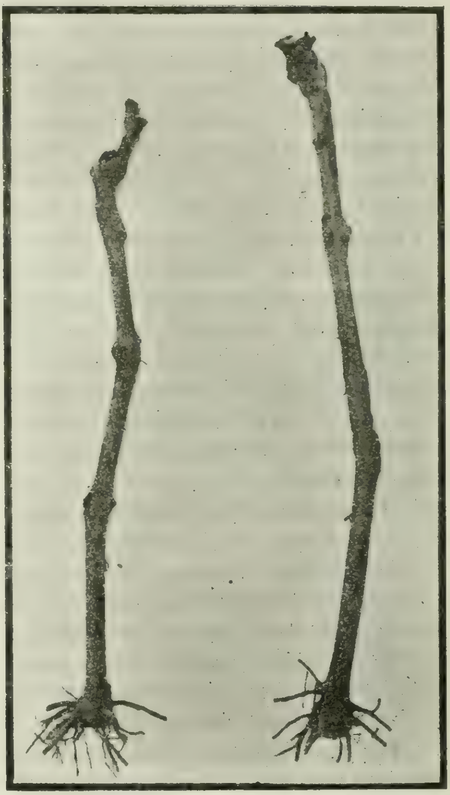


Fig 3.—Vines with growth and roots trimmed ready for planting

Preparation of the Soil.

In all cases it is advisable to subsoil the land when resistant vines are to be planted, for the reason that these American species do not strike downwards so readily as the ordinary European varieties. Having regard to the future welfare of the vineyard, subsoiling to a depth of 18 inches or more is money well spent. It is always well to do the subsoiling some time before planting, in order that the soil may settle and lose its open character. In freshly-broken soil there are always air spaces and pockets between the

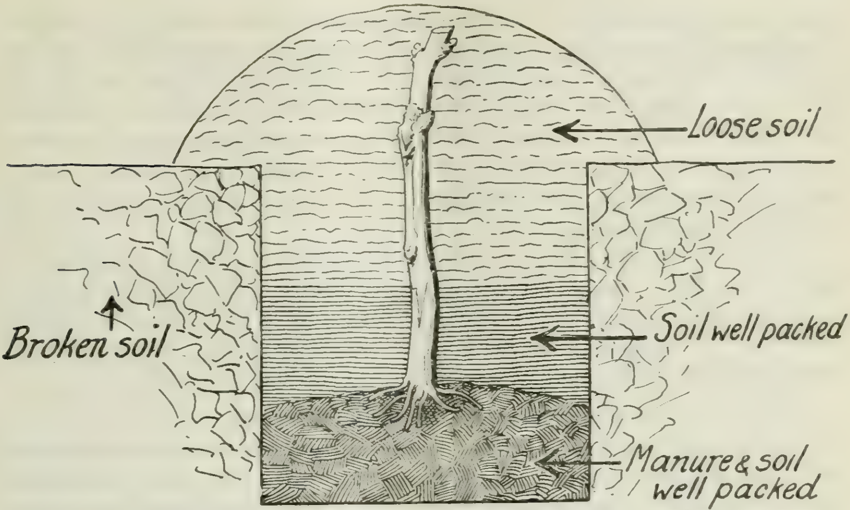
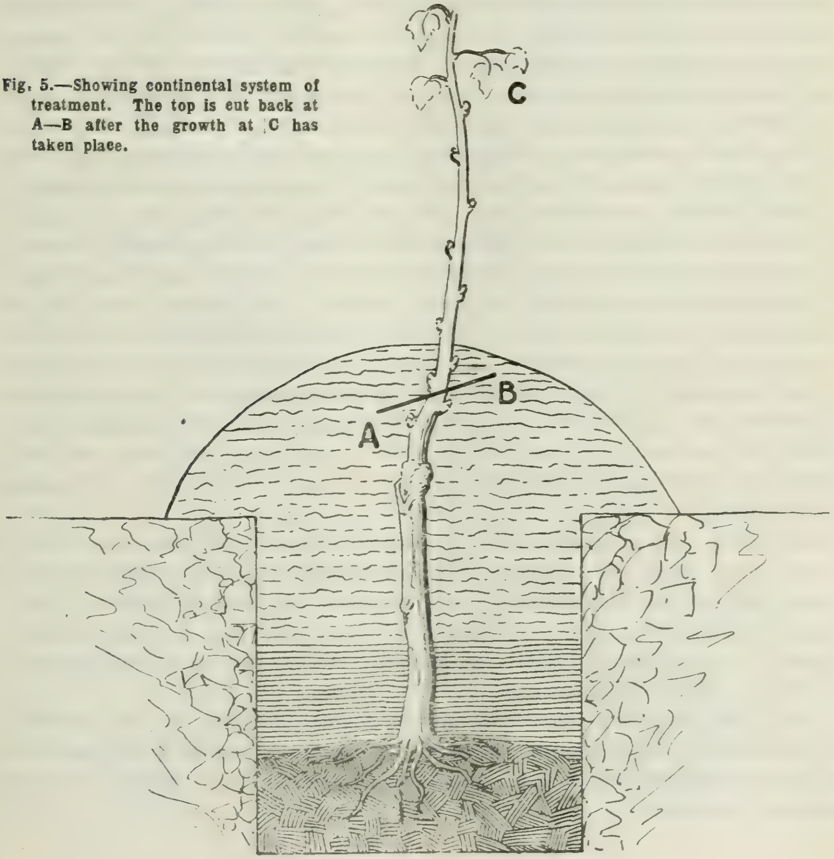


Fig. 4.—Showing depth of planting and vine mounded over for protection.

Fig. 5.—Showing continental system of treatment. The top is cut back at A—B after the growth at C has taken place.



Planting Grafted Resistant Vines.

lumps, and it is possible, if vines are planted while the ground is still in that condition, for the settling soil to leave the roots, or some of them, out of contact, in which case, if the vine does not perish it will make an indifferent start. Every care should be taken in planting to ensure that the soil is well packed around the roots. A handful of superphosphate or bone-dust mixed with the soil below the roots will help to give the young vines a good start. On small areas, some well-rotted manure mixed in with the soil will be found a great advantage.

In planting grafted vines, the mistake is often made of setting them too high. The best results are obtained by planting the vines with about 4 inches of the top above the surface—that is to say, assuming the young vines to be 15 inches from the base to the top of the scion, allowing for the short spur after pruning, there will be about 12 inches below the soil.

Treatment of the Young Vines.

According to French authorities, it is a mistake to prune the young vines hard back prior to planting. The system which they adopt is to reduce the vine to one main cane, which is left entire. After planting is completed a mound is thrown up covering the crown of the vine and protecting the stem and lower buds. With the approach of the growing season, the terminal buds burst, and when they are well out, the mound is moved and the young vine pruned back to a short spur. The object of this is twofold. In the first place, the mound affords protection to the stem and prevents drying. The second reason is more important; generally the resistant vines are rather slow in developing their roots, and oftentimes the scion begins to grow before the root system is strong enough to support the growth properly. If, then, the one cane is left intact until the buds burst, the fact of cutting it back serves to retard the bursting of the lower buds for some little time. In the meantime the roots are securing a hold, and as the spur buds burst will be better able to ensure a vigorous start. This system has a special advantage in the drier districts. The plan adopted locally is to prune the young vines before planting into the vineyard, but the mistake is often made of not protecting the stems. In all cases greater success will be assured if a mound of loose earth is thrown right over the top of the young vine. The effect is to prevent drying and to retard the bursting of the buds, both of which are important points for consideration, more especially if the spring is a dry one.

In dealing with small areas, the mounding is done with a hoe or a spade, but on large areas it is more economical to throw up a shallow furrow on either side of the vines with a plough, thus forming a crown along the row. Provided that the surface is fairly loose, an efficient protection is thus formed. As growth proceeds the mounds are levelled down during the various operations of cultivation.

From this point it is important that the formation of scion roots should be prevented. They readily occur in the young vine when the graft is about at the surface level, but a little care prevents their development to harmful dimensions.

The White Grub or Grass Root Beetle

(*Scitala pruinosa* Dalm.).

W. W. FROGGATT, F.L.S., Government Entomologist.

In the adult state, as beetles, these insects are well known to the residents of Sydney, for in summer they often fly in through open windows in the evening, and, buzzing round the light, break many incandescent gas mantles. Very few householders connect these persistent intruders with the small white grubs that are often turned over when digging the rich loamy soil of the garden, yet these are the larvæ of these night-flying beetles.

Though these beetles are foliage eaters, it is in the larval or grub stage that they do so much damage to grass lands, lawns and field crops. They are known to economic entomologists as "white grubs," developing, under favourable weather conditions, from the eggs deposited in the soil in enormous numbers, and often destroying large areas of cereal crops and grass. This species was described by Dalman in 1823, and recorded again by Boisduval from Sydney in 1835 under two different names. It has an extended range along the southern and eastern coast of Australia, and under natural conditions existed upon the roots of native grass and herbage. The new and more favourable conditions created by the clearing of the native scrub and coarse grass, and the planting of fine cultivated grasses has caused an abnormal increase of these beetles, so that they have become a serious pest.

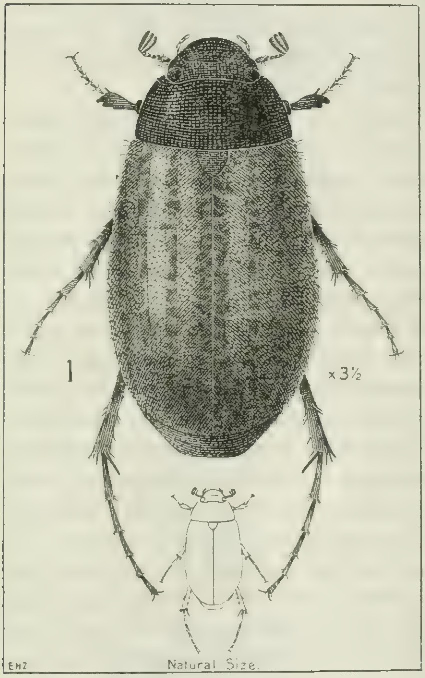
In 1917 the writer's attention was called to the serious damage they were doing on the Leura golf links. The secretary (Mr. I. Portus), following the advice given, ploughed up the infested area and got rid of the pests.

In 1918, however, they again appeared in numbers and on many parts of the links where it was impossible to plough, and they also invaded some neighbouring lawns. Early in May the writer paid a visit to Leura and collected specimens for future observation. A remarkable object lesson of the damage they could cause was afforded by Mr. T. P. Simpson's lawn, facing the links. Over two-thirds of the area, consisting of loose sandy mould, was so thickly infested with well-grown white grubs feeding just beneath the surface, that the ground was quite soft and spongy to the tread. The remains of the surface grass were brown and broken up like chaff, while the grubs were finally turning their attention to the roots of the shrubs and annuals growing in the adjacent garden beds.

Large numbers of the grubs were brought to Sydney, and some were kept for six months in a propagating box of sandy soil and grass, where pupæ were found at the end of November. Another large series were placed in a portion of a lawn enclosed in sunken battens in the Botanic Gardens, but on examination a few months later, no specimens could be found; they had either succumbed to unfavourable surroundings or escaped into deeper soil. Specimens kept in soil in the jars, in the insectarium, all died within a month of their confinement.

From these investigations the full-fed larvæ appear to commence to pupate late in September, and the first beetles appear towards the end of November. Though several American entomologists state that other species of allied lamellicorn beetles take two years to reach maturity, it appears to us that the life cycle of *Scitala pruinosa* is completed in a year.

Information has been furnished by Mr. R. S. Black, foreman at the Leura golf links, who has also carried out a number of experiments under the writer's suggestion. Writing on the 9th December, 1918, he says :—



White Grub Beetle (*Scitala pruinosa*).

> During the past couple of weeks there have been swarms of these brown beetles covering the foliage of the native shrubs, but feeding chiefly upon the young foliage of the stunted mallee gums. During the day none are to be noticed flying about, but they are congregated in considerable numbers under the shelter of any rubbish —like manure, dead wood, and leaves. Large numbers are also to be found beneath the surface of the soil at the roots of the native trees, where I have often taken over thirty at one tree on the golf links. Another place where they congregate is under the leaves of the native dandelion. About dusk, between 6·30 and 7·30 p.m., they are on the wing in thousands, or clustering on the stunted gum foliage upon which they are feeding. As darkness approaches they disappear, where, I cannot say, but looking closely at the grass land thousands of small holes can be seen. When they leave the foliage on which they were feeding, they burrow into the soil, or under the rubbish previously mentioned, either to deposit their eggs, or for shelter during the daytime. On the second temporary green, which was infested with grubs early in the season, I removed the hole and found between twenty and thirty beetles. Opening some, I found their ovaries packed with from thirty to forty creamy white eggs. Further examination showed a few tiny maggot-like grubs, which I think were freshly-hatched beetle larvæ. It is evident that the beetles have been depositing their eggs, and the earlier ones have already hatched out, in the soil. It is now a rare occasion to find a full-grown grub in the soil.

In response to further inquiries Mr. Black furnished the following interesting notes on the white grub pest on the 24th April of the present year :—

> The white grubs are again fairly plentiful here this season, but, up to the time of writing they do not seem to be as numerous as last year, probably owing to the extremely dry season we have just passed through. The ground was very hard and dry towards the end of November, when the beetles were burrowing into the soil to deposit their eggs. The grubs at present are chiefly found working in hollow places in the grass land—hollows such as would catch any light rain which had fallen earlier in the season, and where the soil, therefore, remained moist. They are also to be found in damp heaps of soil and manure handy to their feeding grounds, but I have not found many in similar heaps in the open places any distance away from eucalyptus scrub, where they congregated at the end of last year. From November to March the presence of the grubs under the grass was not noticeable. This period was a dry one. About the middle of March there was a rainfall of several inches, but it did not soak far into the

ground, and it was followed with another dry spell of several weeks. After the rain I found many young grubs in the heaps previously mentioned, but did not notice any in the grass, except a few on the dandelion roots. April came in with several days of steady rain, giving the ground a good soaking, which was followed by mountain mists that kept everything moist. During this period the grey magpies, black magpies, laughing jackasses and starlings appeared and started their work of grub eradication, and it was through their presence that we could define the areas most grub-infested. The grey and black magpies, natives of this district, are very noisy and bold in wet weather; they are excellent grub-hunters, but in turning up the soil they tear out lumps of grass, and do a good deal of damage to the turf. They go in flocks of from twenty to forty, and are responsible for the destruction of a great number of the grubs. The laughing jackasses, also local birds, are great grub-hunters, but are limited in their numbers. The starlings are new to the golf links, this being the first year I have noticed them here in large numbers. They are our most effective grub-eradicators, the flocks working close together over an infested area until they have practically cleared it of grubs; and they do not tear out patches of the shallow-rooted grass that has been eaten by the grubs, and leave bare patches in the turf, as do the grey and black magpies. They are, however, very shy, and are very easily frightened away by the golfers; otherwise, I have no doubt, they would not be long in their work of clearing out the white grubs.

Some people have the idea that these white grubs were first introduced to Leura in rotted stable manure brought from Sydney, but I am inclined to doubt this theory on the following facts:—About five and a half years ago I was shown a lawn, laid down with English lawn mixture, about a mile from our golf links, which had been completely eaten out by these grubs. No Sydney manure had been used on this lawn. At the golf links, early in April, 1914, I sowed a portion of a flat, of fairly good soil, with *Agrostis alba stolonifera* grass seed, the only fertiliser being artificial manure (Shirley's No. 9). A fine growth was established, but two years later it was infested and damaged by white grubs. Up to this date (1916) no rotted stable manure had been brought to the golf links from Sydney. After careful observation I have come to the conclusion that these white grubs do not attack grass before it is two years old.

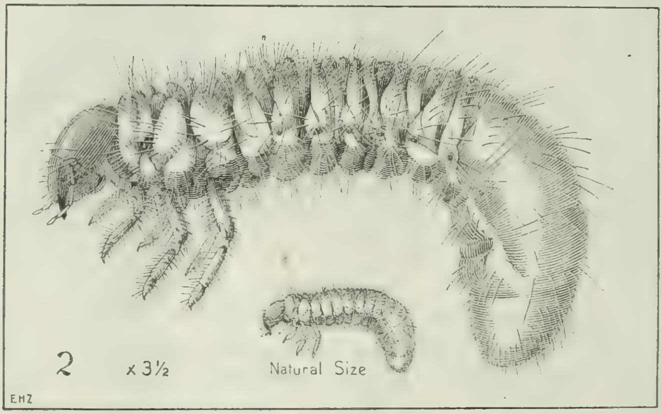
Descriptive.

The perfect beetle measures nine lines in length, and is somewhat elongate in form. The head and thorax are black, finely punctured on the dorsal surface; the under surface, antennæ and palpi reddish brown; the legs reddish brown, darkest on the tibiæ. The wing covers are shining, slightly iridescent, yellowish brown, very finely and irregularly punctured, and impressed with well defined parallel bars, the inner ones on either side of the median suture darkest, with four similar bars on either side between the median suture and the outer margin; the first inner two irregularly spotted. The outer margin curved inwards in a line with the base of the middle pair of legs; the tips broadly rounded. The under surface of the thorax and abdomen reddish brown.

The full grown larva is a thick-set, deeply wrinkled white grub, with a rounded light yellow head, and three pairs of yellow legs; the tip of the abdomen is smooth and rounded. When disturbed in the soil they assume the characteristic attitude of the larvæ of many lamellicorn beetles of curving the tip of the body round to the head. In the soil they are fairly active creatures; and can soon bury themselves again in the earth after they have been turned up with the spade. Length, ten lines. They pupate in the soil in a cavity fitting round the chrysalid, enveloped in a fine pupal membrane or skin.

Suggestions and Experiments.

When these white grubs make their appearance in land that can be turned over with the spade or plough, there is no difficulty in getting rid of them; but it is a very different question when lawns, growing crops, or the grass of golf links are attacked by countless thousands. In the fine sandy soil of some of the lawns that had been actually reduced to a bare, spongy surface of dead grass, I am sure that a fine, long-toothed rake could have been drawn through the soil and the bulk of the grubs collected from the earth. Even in some parts of the golf links a fine, heavy, specially constructed harrow could probably be used, and would effectively destroy a large percentage of the grubs without doing much damage to the grass roots. At one place the gardener had sunk hardwood boards across the lawn to cut off the infested area from that in which the grubs had evidently not been bred, but into which they were slowly moving under the soil. This had been very effective, and the damage, if observed in time, might in many cases have been confined to a limited area.



Larva of White Grub Beetle.

Attempts at controlling the pest by fumigating the soil with bisulphide of carbon indicated that that method would be prohibitively expensive; and soaking the soil with concentrated tobacco extracts in solution had the same objection.

Tar water was suggested at a later stage, but no experiments have as yet been undertaken with this mixture. It is made by dropping coal tar into heated water, and the impregnated water is then poured over the grub-infested area. About half a pint of tar to a gallon of water would be fairly strong, and should not damage the growing grass. Sulphate of ammonia might also be used ; it would promote the growth of the grass, and if it came in contact with the grubs it should kill them.

As previously noted, the freshly hatched-out beetles mass together on the foliage of small scrub trees in the vicinity of the grass lands, and might be poisoned or trapped and destroyed before they deposited their eggs in the soil. The latest American authorities state that the destruction of the adult beetles, when they emerge from the soil and congregate together on their food plants before depositing their eggs, is one of the most effective methods of keeping them in check. The destruction of the white grubs by collecting them out of the soil is also advocated where practicable.

Effect of Frost on Maize.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

THE question has been recently raised whether there are frost-resistant varieties of maize. It is well known that maize is a hot climate plant, and it is doubtful whether any variety of maize exists which can be strictly called frost resistant. It is at least certain that there is no reason to warrant the attempt to change its season of growth from summer to winter in any climate, except in the frostless zones of the tropical regions.

At the same time, it is known that late maturing varieties, which are usually grown on the coast of this State where but little frost occurs during any part of the growing period, do not withstand frost as do early varieties which are grown on the tablelands. This is, firstly, because frosts are not so killing in a normally dry atmosphere as in humid regions, and this comparatively greater resistance to frosts on the tablelands as compared with the coast is further accentuated by acclimatisation of the variety of maize grown; secondly, maize is more materially injured by frost at the latter end of its growth than at the beginning, for all further growth ceases with a heavy autumn frost on well-grown maize reaching maturity, the more sappy or immature the crop the fewer degrees of frost being necessary to injure it. Air-dry grain will stand almost any natural temperature below zero, while grain on the cob with 25 or 30 per cent. moisture will not stand more than a few degrees of frost, if that, without injury to the germ. With the shorter season of growth on the tablelands, autumn frosts are more likely to occur before the crop is properly mature.

A spring frost on young maize does less damage than an autumn frost on maize in the cobbing stage for the following reasons:—

(*a*) It takes a heavier frost to cause any injury to young maize plants than to maize in the process of grain formation.

(*b*) Late spring frosts do not affect some varieties of maize as badly as others, whereas the damage from early autumn frosts is the same with all varieties if they are caught at the same stage of immaturity. Further, there is a difference in the growth made by different varieties during cool spring weather.

(*c*) If late spring frosts do permanently injure the main shoot of young maize plants, varieties which sucker freely often nullify or minimise the injurious effect owing to the development of fresh suckers or stools, which ultimately may bear good ears. These profuse suckering varieties are usually early maturing.

(*d*) If total permanent injury is done by spring frosts, replanting may be possible.

For these reasons the following recommendations are made for growing maize in short season districts:—

(1) Procure a very early maturing variety.

(2) Use acclimatised seed, if possible, and select seed ears rigorously for early maturity in the field.

(3) Protect seed ears from frost by removing excess moisture as quickly as possible (by artificial drying if necessary).

(4) Sow as early as possible in spring.

(5) Sow thinly to encourage stooling.

(6) Remove excess moisture from the grain by cutting and stooking in the field. This will scarcely affect the yield of grain, which fills and hardens quickly during two or three weeks' curing on the stalk.

(7) Hasten the maturity by a week or two by the application of superphosphate (alone) at sowing.

(8) Avoid the use of large amounts of soluble nitrogenous fertilisers, which tend to delay maturity.

(9) Test germination of seed ears which are known to be not thoroughly dry before frost. Injury to the germ of maize by frosts is not always indicated in the grain.

(10) Use salt in storing soft maize to facilitate quick drying and to prevent formation of mould.

Flint varieties of maize are, as a rule, earlier than dent varieties in maturing, and also sucker more freely. Two of the earliest flint varieties known are Early Canada and Gehu.

There are, however, some semi-dent and dent varieties of maize which are earlier than some of the flint varieties known in this State. The best of these varieties appear to be Minnesota 23, Golden Glow, North-western Dent and Silver King. These varieties possess the advantage of being better yielders than the flint varieties where they will mature, and are also better for feeding because the grain is not so hard.

A high-yielding variety of maize which is a little too late for a certain district, is of more value if taken in hand for rigorous selection for early maturity in the field than an early poor-yielding variety. Selection in this way and the use of acclimatised seed will be found to soon have a telling effect.

Drying seed ears quickly by special means, such as hanging in a well ventilated room which contains a stove or fire, will be a wise provision in very cold climates.

Good seed does not rot in the soil by being sown early as much as is thought. On the Northern Tableland, young maize has been known to be blackened to the ground by frost when 6 or 8 inches high, and has come through again and made an excellent crop. The moisture in the soil here plays some part, recovery from frost being much more certain in soils well provided with moisture. Very high yields (comparable to those of the coast) are not obtainable on the tablelands, and better yields will be secured, in any case, from thinner seedings than are usually given on the coast.

The practice of cutting and stooking maize is not done as widely as it should be in this State. It is a method suited to cold climates, particularly those with dry autumns. The stalks are cut at the base when the grain is in the dough or glazed stage, and stooked or "shocked" in the field for three or four weeks. In this way often severe injury to the grain by frost may be avoided, as a week or two is saved in reducing the moisture content of the grain down to a safe level. This method has the added advantage of getting the maize sooner off the land, and providing a valuable lot of cured fodder or "stover" for feeding to stock at a time when it is most badly needed.

The application of ½ to 1 cwt. superphosphate alone at sowing is known to give maize a quick start, and to aid considerably in the ripening of the grain. As much as a fortnight's difference in maturing period has been observed in favour of this application on the tablelands.

Large amounts of soluble nitrogenous fertilisers, like sulphate of ammonia and nitrate of soda, have the effect of delaying maturity, as well as making the plants more soft and sappy, and therefore more liable to frost injury.

In some cases the germ of the grain is blackened by frost, but in other instances no sign is apparent. It, therefore, becomes profitable to test a few grains from each seed ear for germination before using it for seed.

It has been found that salt at the rate of 6 to 12 lb. for every 16-bushel load of maize from the field has a marked effect in facilitating the drying of the maize in the storage heap, and preventing the formation of mould. This is not a reliable method of treating seed maize, however, owing to the injurious effect of salt on the germ. This quantity of salt with maize is stated in Iowa* to have no harmful effect in feeding to stock. Larger quantities give better results in drying soft maize, but cannot be safely fed to stock.

It will be seen that most of the above recommendations for maize as regards frost are in the direction of escaping frost rather than of resisting it.

INTRODUCING BACTERIA INTO LUCERNE LAND.

OUR experience with pure cultures of plant bacteria for encouraging the growth of lucerne, says Mr. A. H. E. McDonald, Chief Inspector, has not been very encouraging. We have found that the most satisfactory method of introducing the bacteria so beneficial to lucerne is to obtain soil from a paddock where lucerne is thriving well, and to mix this with the seed in small quantities. The bacteria in the soil upon which the lucerne was growing well are thus transferred to the new soil when the seed is sown.

Where lucerne is already established, and there is reason to believe the bacteria are not present in desirable numbers, they can be introduced by obtaining 2 cwt. or 3 cwt. of soil from a field where lucerne is doing well, and distributing it in the same way as fertilisers are applied.

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*Iowa Agr. Exp. Sta. Cir. C 41 (1917).

Spring Management of Bees.

W. A. GOODACRE, Senior Apiary Inspector.

When the bees become active in the spring, the apiarist should take a walk round and note the outside appearance of each colony. If a colony is busy, and the bees businesslike about the entrance, and if a fair quantity of pollen is being brought in, he may pass on to the next, but if a colony is noticed where the bees appear dull and inactive, and where practically no pollen is being gathered, make a note of the number for early inspection There is much to learn regarding the outside appearance, and from taking note, and then inspecting, knowledge will be gained that will give some idea of what is going on inside the hive from the outside appearance.

When favourable weather conditions prevail and the bees are inclined to settle down to spring work, all colonies should be inspected. Attention should be given to the stores by equalising them according to the population. Any colony having no queen should be given a frame of brood containing eggs in worker cells, the brood to be obtained from a progressive Italian strain. By feeding the worker larvæ on special food called royal jelly the bees can produce a queen bee

Another purpose is also served by placing brood in such colonies; the hatching brood will help the colony to retain its strength during the raising of the queen.

It is necessary to watch carefully for progress in the spring and not to allow the colony to become over-populous for the size of the hive, for the effect is to induce an inclination to swarm. When giving extra frames, it is well not to make it a practice to place them in the centre of the brood nest; it is more favourable to place them at the side of the brood nest, and less risky. The idea of spreading the brood in the spring should be discarded, for the queen will attend to that; she knows considerably more about the business than we do.

Full sheets of comb foundation should always be used in the brood nest They make a wonderful difference in the building up of weaker colonies, and are also of considerable advantage when used in populous colonies. The use of full sheets of comb foundation is not considered an expense by the majority of successful practical apiarists, for they know that not only do the bees get to work quickly, but the apiarist has the benefit of having select combs for years to come. If wax is sent to the factory the apiarist can have it made up for about 10d. per lb.

Essential Points in Spring Management.—(1) Early inspection; (2) equalising stores; (3) supply a frame of brood to all colonies requiring a queen; (4) give stimulating feed if there is pollen and no nectar, providing the weather is mild and unchangeable.

Hiving Natural Swarms.

This is a question that will always need thought and common sense. The very word "natural" in the heading tells us that we have to follow nature in our methods of hiving. For instance, a swarm issuing from the parent colony does not expect to find a home fully prepared with drawn combs and honey; therefore when preparing hives for their use, supply foundation only. It is also necessary for the swarm to have ample space. Do not place a large swarm in a single storey; let them see that they are not going to be overcrowded in a week or two.

It is also advisable to put in the hive a straight comb containing a quantity of unsealed brood and eggs, which has been obtained from a progressive Italian colony. The bees will at once attend naturally to the larvæ, and feel contented in a new home that has ample space for progress. An excluder may be placed on the entrance as extra security, but it will be found that if the above methods are used there will be little chance of the colony becoming discontented and absconding.

Swarming is not desired by the practical apiarist, but nature has her own way, and we have to preserve a knowledge of hiving swarms. A great deal can be done, however, towards ensuring a minimum of swarming by again following nature. For instance, it is natural for a colony upon becoming overcrowded to develop an idea of swarming, and the apiarist must prevent this by allowing the bees always to have space for development. By keeping Italian bees the tendency to swarming will be lessened, especially if the queens are raised from a vigorous race selected for non-swarming qualities. I have seen a colony of leather-coloured Italian (Ligurian) so populous that it took forty-seven full depth Hoffman frames to accommodate them comfortably, but no inclination to swarm was shown.

To minimise the risk of having "after swarms," the parent colony should be inspected immediately after the swarm has issued and queen cells destroyed, leaving on the one frame, if possible, two of the best in respect of size and appearance. It will be found that in the majority of cases the queen issuing from one cell will then destroy the remaining one.

Essentials to the Control of Swarming.—(1) Ample space for development in the hive; (2) ventilation of the hive so as to prevent the bees from clustering about the hive on a warm day; (3) a young Italian queen that has been raised from a vigorous non-swarming strain.

The Care of Surplus Combs.

The care necessary for the preservation of surplus combs is greater this season than is generally the case, for in many localities the colonies were in a weak condition in the fall, and apiarists found it necessary to remove a considerable number of surplus supers. As the combs contained in these supers are valuable, it is necessary to protect them from such pests as wax moth and mice. If they are given correct attention no trouble will be experienced from mildew, and the risk of spreading disease will be minimised.

What has to be aimed at is to get as nearly as possible to the direct opposite of the conditions that are ideal for the increase of the pests, and at the same time to preserve the combs so that they will be serviceable after storage. As far as wax moth larvæ is concerned, more trouble will be experienced in the spring than is generally the case during winter; and the combs in which brood has been raised will be more liable to attack than new combs or those that have been used for honey storage only.

In the first place, the combs should be stored in a dry bee-proof room as a protection against the spread of disease, and the excitement caused by robbing, for by chance a small quantity of honey may be in the combs.

Second, remove one comb from each super, and adjust the remainder to about equal space.

Third, place four tins on the floor and pile the supers on these, as a protection from mice.

Fourth, do not use any cover or bottom board; free circulation of air is desired as a protection against moths; this treatment will also prevent mildew.

Fifth, allow as much light as possible in the room.

It will be necessary to have an occasional look over the combs, and if they become infested with the wax moth larvæ they will have to be fumigated with burning sulphur before the pest makes much headway. This can be carried out in the following manner, which will be found to be easier and more effective than most other methods :—Have a quantity of red hot coals in a pan, and place on them about two handfuls of sulphur. Immediately this has been done, place an empty super over the pan and pile the infested supers and combs on this. A cover must immediately be placed over all. Sulphur fumes, when united with the oxygen of the air, form a poisonous gas known as "sulphur dioxide" which is effective in destroying the larvæ of the wax moth.

To prevent the pest from breeding, do not leave hives containing combs about the apiary when they are not in use by bees. They are worth caring for, but quite apart from that if not attended to they make excellent breeding grounds for the wax moth and for many other diseases.

Do not leave old "slumgum" from the wax press lying in a box, for this also is appreciated by the larvæ.

Do not leave four supers on a colony that is only capable of protecting four combs. A strong colony of Italian bees would take care of a few in the spring.

Do not wait too long after cutting out any combs before melting up; for you may find much of your valuable wax destroyed.

Neutralising Acidity in Cream.

A. A. RAMSAY, Principal Assistant Chemist.

DATA on the rate and amount of the reduction in the acidity of cream treated by the "flash" and "holding" systems of pasteurisation, have been collected and tabulated in a complete manner, awaiting publication in a suitable form. Its technical nature makes it somewhat unsuitable for the pages of this journal, but it is thought the summary of conclusions would interest those engaged in the manufacture of butter.

Laboratory experiments in neutralising the acidity of cream show :—

(*a*) That in using sodium bicarbonate as a neutralising agent, 94 per cent. to 104 per cent. of the reduction which should theoretically be produced is obtained ;

(*b*) That in using lime as a neutralising agent, 88 per cent. to 96 per cent. of the reduction which should theoretically be produced is obtained.

Experiments made at certain factories under ordinary working conditions show that in neutralising the acidity of cream :—

1. The percentage amount of neutralisation effected in the two systems by using (*a*) lime, and (*b*) sodium bicarbonate, is as follows :—

	Flash.			Holding.	
	Lime.	Sodium Bicarbonate.		Lime.	Sodium Bicarbonate.
5 minutes after addition...	68	85·9	10 minutes after adding ..	65·2	62·5
10 ,, ,, ...	70·5	96·5	15 ,, ,, ...	69·9	67·3
15 ,, ,, ...	72·4	102·7	30 ,, ,, ...	74·5	77·5
During pasteurisation, additional	24·1	10·9	1 hour ,, ,, ...	86·3	80·1
			2 hours ,, ,, ...	86·3	85·9
Total	96·5	113·6			

2. The action of both soda and lime when well mixed with cream is very rapid. *Intimate mixing and rapidity of action appear to go hand in hand.*

3. The mixing of the lime and cream by well stirring the mixture with a wood rake in the neutralising tanks used with the "flash" system is very good, and equilibrium of the mixture is quickly attained.

4. The mixing of the cream and neutralising agent with the "holding" system does not appear to be so rapid or so uniform as in the "flash" neutralising tanks.

5. There appear to be wide differences in the efficiency of "holding" plants in general use.

6. The mixing in "holding" vats containing small quantities of cream appears to be satisfactory, but may become indifferent or even unsatisfactory when the "holding" vats are full.

7. In using sodium bicarbonate, when the "flash" system is used, there appears to be a slightly greater reduction in acidity than is indicated by theory.

8. The results open up a field of investigation as to what becomes of the 14 per cent. of the efficiency of the neutralising agents when using the "holding" system of pasteurisation, and of the cause of the apparent ultra-theoretical neutralisation caused by sodium bicarbonate when used with the "flash" system.

9. Where efficient mixing obtains, as is the case in the 200 gallon tanks used for neutralisation in the "flash" system, sodium bicarbonate is quicker in its action than lime.

THE CULTIVATION OF ARROWROOT.

UNDER ordinary conditions arrowroot will produce good results on the North Coast, and in favoured localities as far south as the Hunter River district. As a matter of fact, fairly payable yields have also been obtained at Hawkesbury Agricultural College. Rich soil of a fairly free character is required.

The crop is sown by planting tubers in rows of 3 feet 6 inches to 4 feet apart, and about 2 feet apart in the rows. Planting is done in the spring, and the crop is ready to harvest at the end of the following summer (about May or June). The yield of roots varies from about 12 tons to 20 tons per acre, and the bulbs contain up to about 28 per cent. of the starch, which is the arrowroot of commerce. The marketable product runs from 1 ton to 2 tons per acre. A considerable amount of care is required in preparing the product for market, as it must be thoroughly cleaned and freed from all dirt.

All the arrowroot consumed in Australia is produced in Queensland, and when the seasons are favourable there the market price is comparatively low, but during the last three or four years the average price of prepared arrowroot has been £30 to £35 per ton, so that in small areas the crop will probably be profitable for a year or two.

The crop is valuable as pig feed, producing heavy yields of roots of good fattening quality, which the pigs are allowed to forage for themselves, being merely turned on to the ground when the crop has reached maturity in the autumn.

In a small way commercial arrowroot can be prepared by the use of the following improvised appliance :—A piece of galvanized iron about 10 inches wide and 2 feet long is punched with holes about ¼ inch apart, using a small nail or punch, and making the surface somewhat like a nutmeg grater. This is tacked on to a board with a curve in the iron, similar to the curve of an iron trough. Wash the roots thoroughly, and then grate them on this appliance by hand. The fine material obtained by this grating is then passed through sieves and thoroughly washed in several changes of water. The arrowroot sinks to the bottom, the water is poured off, and the cleansing repeated until the wash water is perfectly clean. It is then ready for use or for marketing.—A. H. E. McDONALD, Chief Inspector.

The Packing of Fruit.

[Continued from page 436.]

W. J. ALLEN and W. LE GAY BRERETON.

ALTHOUGH the remarks that follow, dealing with the analysis of the pack, may seem almost to belong to the previous section (the formation of the pack), it has been deemed advisable not to attempt to combine our consideration of the two aspects of the matter, as the directions for the formation of the various packs might then prove cumbersome and confusing.

Analysis of the Pack.—If the formation of the 2–1 pack, as described last month, is followed, it will be noticed that the first tier starts with two fruit and one space, and may close with one fruit and two spaces, or with two fruit and one space. If the numbers in the longitudinal rows are the same in each row, such as 3–3, 4–4, 5–5, &c., of the 2–1 packs, then the first tier closes with one fruit and two spaces, and there are three longitudinal rows, each containing the same number of fruit. Similarly, the second tier starts with one fruit and two spaces and closes with two fruit and one space, so it also has three longitudinal rows containing the same number of fruit in each, and the count of the second tier is exactly the same as the count of the first tier. The first, third and fifth tiers will all start with two fruit and one space, and the count will be exactly the same as second and fourth tiers, which will start with one fruit and two spaces and close with two fruit and one space, and the total count for the case is the count in the first tier multiplied by the number of tiers, which in the Australian bushel case is 5.

If this is compared with such counts as the 4–3, 5–4, 6–5, &c., of the 2–1 pack, where the numbers in the longitudinal rows are unequal, it will be found that the first, third, and fifth tiers start with two fruits and one space and close with two fruits and one space. Thus the tiers named contain two outside longitudinal rows of the higher number and one (the centre) longitudinal row of the lesser number. On the other hand, the second and fourth tiers start with one fruit and two spaces and close with one fruit and two spaces, so that these tiers contain two outside longitudinal rows of the lesser count and one (the centre) longitudinal row of the greater count, and therefore contain one less fruit, and the total count will be the count of the first tier multiplied by 5 (the number of the tiers to the 2–1 pack in the Australian bushel case) less two.

The correct count is put on the chart, so that the packer's time is not wasted in making calculations.

Now, it will be noticed that there are five tiers, of which three are of the higher count and two of the lower, so that the first tier should be started with two fruit, not with one, otherwise these counts of the 2–1 pack where the numbers of the longitudinal rows are dissimilar would contain three tiers of the lesser count and two of the greater, and if the case were marked according to the chart it would be one fruit short. For this reason the pack should be called 2–1, not 1–2. Moreover, as counts with longitudinal rows of unequal numbers start always with the higher number, and also as the longitudinal rows with the higher numbers predominate, if correctly packed 2–1 (not 1–2), these counts should be called by the higher number first thus 5–4, 6–5, 7–6, &c., not 4–5, 5–6, 6–7, &c.

It will also be noted that in making the count on the case from the chart it is important that the correct number of tiers be adhered to, and a packer when first adopting the numerical system, until he has gained confidence in it, will sometimes feel anxious on this point. Now, it is tiresome to keep (and very easy to lose) tally of the tiers as they go in, but provided one starts correctly and does not break his pack or reverse his case end for end during packing, he can tell the number of his tier by remembering that the first, third, and fifth tiers of all 2–1 packs start with two fruit, and the second and fourth tiers start with one fruit, and in such counts as 4–3, 5–4, 6–5, &c., of the 2–1, whether the case is reversed or not during packing, the first, third and fifth tiers start with two fruits and end with two, and the second and fourth tiers start with one fruit and end with one. It is also wise for an absolute novice to note the count of the longitudinal rows of his first tier as soon as completed, and if he remembers his first tier was, say, 5–4, then the fifth of last tier must be 5–4. In fact, when supervising the work of several such learners it has been found helpful if they marked on the end of the case on which they start the numbers in the longitudinal rows of the first tier, for then, whether they reverse their case or not during packing, one can judge their work better, even if every tier is not inspected before being covered by the next.

As the 2–2 pack has four longitudinal rows (an even number) each of the six tiers will have the same count even when the numbers of the rows are unequal. Take the 7–6, for instance; in each tier there will be two longitudinal rows of seven, equal to fourteen, and two of six, equal to twelve, making twenty-six to the tier, and in the 2–2, or in any pack that has an equal number of longitudinal rows, the total count is obtained by multiplying the count of one tier by the number of tiers, which is six for the 2–2 in the Australia bushel case and four in the Canadian case. It will also be observed that every tier must start with two and close with two. However, provided it is known from which end and side the case was started and true space packing has been adhered to throughout, one can still judge whether the number of the tiers are correct if the following facts are remembered.

Assuming that the pack was started in the left-hand corner, then there will be a space in the right-hand corner, and in counts such as 6–6, 5–5, or 4–4 (where the numbers in the longitudinal rows are equal) then the first, third and fifth tiers will close with a fruit in the right-hand corner and with a space in the left-hand corner. The second, fourth and sixth tiers will work in the opposite way. With those counts that have the numbers of the longitudinal rows unequal, such as 7–6, 6–5, or 5–4, then the first, third and fifth tiers, starting with a fruit at the left corner, will close with a fruit in the left corner and a space in the right corner; the second, fourth and sixth tiers will be the opposite.

With the 3–2 pack there is an uneven number of longitudinal rows (five), and thus with counts where the longitudinal rows have equal numbers, such as 4–4, 5–5, &c., the first, third, fifth and seventh tiers will start with three fruits and two spaces and close with two fruits and three spaces, whereas the second, fourth and sixth tiers will start with two fruits and three spaces and close with three fruits and two spaces, being the exact reverse of the first, third, fifth and seventh tiers, which like them, will have three longitudinal rows of the higher number and two of the lower number. Thus the total count will be the count of the first tier multiplied by 7, the number of tiers to the 3–2 pack in the Australian bushel case. In counts with longitudinal rows containing unequal numbers, such as the 5–4, 6–5, &c., the first, third, fifth and seventh tiers will contain three longitudinal rows of the higher number and two longitudinal rows of the lower number. and these tiers will start with three fruits and two spaces and close with three fruits and two spaces, whereas the second, fourth and sixth tiers of these counts will start with two fruits and three spaces and close with two fruits and three spaces, and contain three longitudinal rows of the lower number and two of the higher number. The count of these three tiers will be one less than the count of the first, third, fifth and seventh tiers, and the total count will therefore be the count of the first tier multiplied by 7, less three.

While the Australian bushel case thus allows of seven tiers, the Canadian case comes up in five tiers, so that in counts containing longitudinal rows of unequal numbers, the total count will be the count of the first tier multiplied by 5, less two. Bearing these facts in mind and knowing at which end the pack was started, if true space-packing has been adhered to throughout, it can be judged whether the pack contains the right number of tiers or not.

It may be pointed out here that packs containing an even number of longitudinal rows will increase or decrease in count by the same number each time, and that the amount of increase will be governed by the number of fruit forming the cross rows multiplied by the number of tiers. Let us take the 2–2 pack; it has four (an even number) longitudinal rows, a tier of which contains two more fruit than the tier of the next count lower and two less fruit than a tier of the next count higher. For instance, take (*a*) 5–5, (*b*) 6–5, and (*c*) 6–6:—

(*a*) contains twenty to the tier, two less than (*b*);

(*b*) contains twenty-two to the tier, two more than (*a*);

(*c*) contains twenty-four to the tier, two more than (*b*).

To arrive at the total increase, multiply the increase in the tier (two) by the number of tiers, which in the Australian case is six; the result is twelve. In the case of the Canadian package the increase (two) will be multiplied by the number of tiers (four), which gives eight. In a similar way the 3–3 pack will increase in regular multiples of 3.

In packs that have an odd number of longitudinal rows, such as the 2–1 (three rows) and 3–2 (five rows), the increase will vary by one alternatively. Thus, in the 2–1 x five tiers (Australian bushel case), the increase between counts with longitudinal rows of equal numbers to the next higher count with longitudinal rows of unequal numbers will be eight, whereas the increase from counts with longitudinal rows of unequal numbers to the next higher count with longitudinal rows of equal numbers will be seven.

Similarly, with the 3–2 x seven tiers (Australian bushel case), the variation will be eighteen and seventeen, and with five tiers (Canadian bushel case) thirteen and twelve.

The approximate sizes given in the chart published in the *Gazette* of May were obtained at the Government Orchard, Glen Innes, some years ago. Cases representing the various counts were taken from consignments packed for market. These were opened on the side, and the transverse diameter of the apples from the exposed tiers removed and measured with calipers. Difficulties preventing absolute accuracy at once became evident.

Most apples have more than one distinct transverse diameter, the difference often being one-eighth of an inch and over, and some averaging of these diameters was necessary.

The apples were sized direct from the bench as they were packed, and although the uniformity of the sizing was quite sufficient for all practical purposes, it was found that most of the apples in the cases were within the one-eighth of an inch range, though some were found to be slightly above and some slightly below the range. The size was taken from the majority, but strictly this would not be the true range of the contents. Special reports were asked for on the Glen Innes consignments, from which counts were taken for measurement, and the agent highly commended both the sizing and packing.

To avoid unfamiliar fractions, and in order to include the recognised specified sizes (2¼ inches, 2½ inches, 2¾ inches, &c.), the measurements were confined to one-eighth of an inch, but, as has been previously stated, although the length of range in some varieties may be one-eighth of an inch it may start somewhere below and end somewhere above the specified size. In other words, the sizes given are to that extent only approximate. If the chart is consulted it will be noticed that, except where a change occurs when two counts operate on one range, one on the higher and the other on the lower end, the sizes drop one-eighth of an inch for each successive higher count. It is quite possible to drop alternate counts when the range will be a quarter of an inch instead of an eighth. This wider range does not allow quite such an attractive pack, but is resorted to in small runs, such as are got from variety trials in the Government experiment orchards, or at the clean up of a pack, when there may be odd ends of sizes not sufficient to complete a case. Divided into two counts, there would not, perhaps, be a full case of either, but if a wider range is used there may be sufficient to pack one. The 3–3 count of 2–1 pack on the chart is an example of this. If the one-eighth of an inch range were adhered to it would show as 3⅞ inches to 4 inches, but, as a matter of fact, 3¾ inches to 4 inches fruit was used. In outsizes, which really are not desirable, the wider range is quite close enough and buyers would not expect them closer. Although the closer range is advocated for general work where the run is big enough it must not be thought that the impracticable is sought after, for though in the main the fruit will be within the one-eighth of an inch range, it is well recognised that there will be some fruit slightly over and some slightly under the range.

In the low counts of the 2–1, or in other cases where packing on the flat is resorted to in order to gain the desired height in the specified number of tiers, the transverse diameter of the apple takes up the length of the case, and if the sizes given for those counts were perfect discs it would be found in some instances, perhaps, that they would not fit in. But as already pointed out, the transverse section of a fruit is seldom a perfect disc, and one transverse diameter may be sufficiently over the size to place it well within the size given, and yet the other transverse diameter be somewhat under the given size. A packer will automatically turn the fruit so that it fits closest and allows the full number to come into the tier. Moreover, it has already been admitted that in actual practice a few fruit slightly under range of size may be found.

Count v. Size.—If a case is marked with a specified size it should contain no fruit under the specified diameter, and though no doubt many thousands of cases have been accepted by buyers of a certain specified size that contains fruit under that size, still legally acceptance could probably be refused on this score, and at any rate a mark should be absolute. Now, from the foregoing notes on sizes the difficulty of guaranteeing the absolute accuracy of a size mark will be seen. Even if perfect sizing were practicable without appreciably reducing the speed (in other words, increasing the cost of packing too much) other factors would obstruct. To use more than one set of specified sizes would be cumbersome, and the one set might not suit all varieties. Say a certain variety when packed ranges from $2\frac{5}{16}$ inches to $2\frac{7}{16}$ inches (a one-eighth of an inch range), it could not be marked as 2⅜ inches, though it might have a great many fruit up to 2⅜ inches or over. It would have to be marked 2¼ inches, and this marking down would continue right through all the counts of that variety.

If a numerical system is followed faithfully, the count, which is absolute, can be marked on the case. The count in itself is an assistance to the buyer, but more than this, it is a guide as to size where a standard pack is adopted. The more universal its use becomes, and the size mark is dropped, the more will buyers become familiar with the counts that suit their trade. That the count mark is sufficient guide to size was demonstrated when large consignments of American apples were sold on the Australian markets with no other size indication on them than the count mark. To come closer home on a small scale, when the numerical system was adopted at the orchard at

Glen Innes Experiment Farm, the count and a quality mark (A, B or C) was stamped on the case, but no size mark. This proved quite satisfactory in the markets of Brisbane and country towns, and buyers soon took to ordering by count. If the count is sufficient guide to size, and there seems no doubt that it is, it is a needless expense to put another size mark on. Moreover, it is crowding the case with a useless mark which is apt to lead to confusion.

If, however, one wishes to mark the cases to sizes as well as to count, the sizes of the fruit should be carefully recorded after packing, as the different counts are obtained. It will be necessary to carry this out in connection with all the main varieties handled, and when the sizes of the various counts are definitely ascertained a column should be added to the chart card so that the size can be marked on the cases from the chart according to the count. If specified sizes with a quarter-inch range are used two counts will go to each size, unless only alternate counts are packed.

(*To be continued.*)

A SHEEP LICK FOR DRY TIMES.

A FARMER in the north-west asked the Department some time ago to suggest a lick that would be useful for sheep at a time when grass was scarce and it was necessary to hand-feed. Mr. W. J. Mathews, Sheep and Wool Expert advised a lick consisting of 112 lb. Liverpool salt (coarse granulated) with 3¾ lb. of sulphate of iron and 18½ lb. of bonemeal (calcium phosphate). Another way of preparing the mixture when being handled in quantity would be to take, say, thirty buckets or kerosene tins of the salt, one of the sulphate of iron and five of the bonemeal, and mix these thoroughly together. In view of the dry feed that the sheep were receiving in the case mentioned, the addition of 6 per cent. of Epsom salts to the lick was suggested. More of the last has been used when feed has continued very dry for long periods, but care is necessary not to make the lick unpalatable.

VARIETIES OF OLIVES.

IN South Australia, where olive-growing is carried on to a greater extent than in this State, growers have found that Bouquettier and Gros Redoneau are the two best varieties for their conditions, the former being a very heavy yielder of medium-size fruits that give a good yield of particularly good oil, and the latter producing large fruit, yielding very high returns of oil of the best quality. Other varieties grown profitably there are Salonom, Hardy's Mammoth, Blanquette, Verdale and Silver Verdale.—W. J. ALLEN.

Poultry Notes.

JULY.

JAMES HADLINGTON, Poultry Expert.

HATCHING operations should now be in full swing. Upon the chickens hatched this month and next depends much of the success or failure that is to attend next year's work. It is the chickens hatched in these two months that should be laying most of the eggs next autumn and winter—the very time when prices are likely to be higher than at any other period in the year. Here and there one finds a flock of September-hatched birds in which good development has been secured, and which comes on to lay sufficiently early in the autumn to give them a chance to become winter layers, but it is safe to say that the greater part of the pullets hatched in September under ordinary poultry farming conditions do not lay many eggs before July. The way, then, to secure eggs during the months of high prices, is to hatch chickens early and to ensure the best possible development.

As I pointed out in the paper read at the recent conference at Hawkesbury Agricultural College, the factor of inheritance is, in my opinion, of less importance than proper development. This is the weak spot in present-day poultry culture. The average breeder of poultry is relying too much upon strain and too little on the development that ensures profitable birds. As many poultry farmers must have gathered in the course of my visits to their yards—even where the point has not been expressly stated—I attach more importance to the nature of the development obtained in the young stock than to any so-called strain or line of blood.

The time has arrived, too, when it is necessary to emphasise this more than ever. We want a revolution of thought and practice in poultry culture. There are too many failures—and not because poultry farming is an unsound proposition commercially, but because of the unsound ideas that have crept into it. To repeat—profitable poultry farming is possible independently of strain, but not independently of good development.

The Causes of Lack of Development.

There is more than one cause for lack of development, but the principal ones are (*a*) unsound stock, (*b*) running chickens in too large numbers, (*c*) improper and unskilful feeding. Good breeding counts for little if the chickens are not well grown.

Too intensive methods of rearing and running too many in one flock are all calculated to retard growth. Brooders should be constructed in a manner that will allow of chickens coming to the fresh air. This can only be done by giving plenty of warmth, so that the chicken shall be comfortable even at the point where the fresh air enters—this, of course, where heat is used at all. One of the troubles in connection with rooms heated with stoves in the middle of the floor is that the fire consumes large quantities of oxygen, and that in the very part of the room where the chickens congregate in largest numbers, and where plenty of pure fresh air should be available.

In what is known as "cold brooding," the greatest success is obtained by running chickens in very small lots. In any case, however, greater skill and more constant attention are necessary to ensure success. If poultry keepers would only grasp the facts that poor breeding stock, faulty brooding, and unskilful handling of the young stock are at the root of unprofitable operations, a substantial advance would have been made and the industry would become many times more successful.

Faulty Feeding of Breeding Stock.

During recent years, and particularly last hatching season, quite a number of cases of failure to hatch—some partial and some almost complete—came under notice. In many instances the trouble was traceable to errors in feeding the breeding stock, the most common being an excess of proteids in the food in the form of meat or blood meals. These errors were either due to want of method in feeding, or to neglect to weigh out the quantities properly, or to the belief that the more meat products that are fed the better the hens will lay and the chickens hatch.

To balance a ration composed principally of pollard, bran and lucerne, we only require about 5 per cent. of a meat or blood meal with an analysis of 60 per cent. proteids. If a meal with an analysis of 40 per cent. proteids is being used, about 8 per cent. of the total weight will be sufficient to make up a balanced ration. But investigation in some cases last season revealed that as much as 15 per cent of the ration was made up of a blood meal with 84 per cent. of proteids. In other cases nearly as large quantities of proteids were being fed.

A properly balanced ration has been published several times in these notes, and if farmers would follow the advice as closely as is practicable—using scales to determine the measure of the different feeds, and particularly so with blood, meat meals, salt, &c.—they will not be likely to fall into such errors as cost many the whole of last hatching season.

To put the matter clearly, and to assist poultry farmers to balance their rations as nearly as possible to the varying analytical values of different foodstuffs, it may be pointed out that meat or blood meals vary in their proteid contents, some showing 40 per cent., others 50 and 60 per cent., and, in the case of pure dried blood, as much as 84 per cent. In feeding breeding stock it is better to err on the side of giving too little nitrogenous matter than too much. Skill in feeding is especially necessary with breeding stock—not only in regard to the materials but also the quantities. Both stinting and over-feeding should be avoided, and by over-feeding is meant allowing food to lie about the yards from one meal to another. When once the morning feed is seen to have been left, a gradual reduction of the amount given should be effected at both meals until a keenness for food is seen to have been acquired; thereafter feed more carefully.

One of the surest signs of coming trouble is when the morning food is seen to be left. Skilful feeding in regard to quantities is of even greater importance than a correctly balanced ration, notwithstanding that the last is one of the matters which poultry keepers regard with most concern.

One of the most faulty methods of feeding is where wet mash is fed in the morning, and dry-feed hoppers are retained in the yards. Whatever may be the merits or demerits of dry-mash feeding for layers, the above holds good. Nor is dry mash suitable for feeding to chickens ; in fact, it is one of the causes of failure to secure maximum development, and it should at any rate be banished from the nursery.

ORGANISATION AND CO-OPERATION.

IT is a platitude that British agriculture, with the British nation, and indeed the whole world, is entering a new era, of which all that can at present be said with certainty, is that the conditions will be different from any which have previously existed. Whatever the future may bring, however, it is clear that farmers will find combination not less necessary than before, and that in developing that form of it which is commonly known as co-operation, they will be wise in their day and generation.—Sir R. HENRY REW, K.C.B., Assistant Secretary, Board of Agriculture, England.

(1) Agricultural organisation means saving in cost of production. (2) Agricultural organisation can guarantee the consumer the best article in the best condition. (3) Agricultural organisation contains the seeds of a better and fuller life for the country community.—The Rt. Hon. F. D. ACLAND, M.P., in the *Journal of the Board of Agriculture* (England).

Farmers should regard it as bad form merely to use a society to bring down prices without themselves doing something to support and advance its interests. What is wanted is a universal adhesion to the principles of co operation, not simply a commonplace or vulgar desire to profit by its activities.—*Exchange.*

Orchard Notes.

JULY.

W. J. ALLEN and W. LE GAY BRERETON.

PRUNING will be one of the main jobs of the deciduous fruitgrower this month. When pruning a sharp lookout should be kept for scale or other pests, and the trees marked for special treatment. If scale is only showing on odd trees, such trees should be pruned by themselves, so that the scale is not carried on to clean trees by the secateurs. When pruning scale-infested trees, have the orchard burner standing close by, so that all prunings can be immediately burnt.

Ploughing.

Where cover crops for green manuring have been sown, or where the orchard had not received an autumn ploughing, the plough should be started this month, so that the work will be completed at the end of the month or early in August. Even if the cover crop has not grown to its full extent, it is better to have it ploughed under by the end of July or early in August, rather than to leave it longer, with the risk of it evaporating away the winter rains, should August and the following month turn out to be dry. This also allows time for cover crops to rot and render available the plant food they contain. However, if the orchard was ploughed in the autumn and is not carrying a sown cover crop or one of self-sown weeds, and the ground has not since become compacted and is in condition to catch and retain the late winter rains, then ploughing can be delayed. In this case, the land should be carefully watched and the ploughing done at once if it shows signs of compacting, or if a thick crop of weeds is making headway, the object being to retain the winter rains in the soil as far as possible for use of the trees during the ensuing season. Of course, where ample water is available for irrigation this care is not so important.

Peach Leaf Curl.

Peaches and nectarines, except the early starting varieties, as mentioned in last month's notes, should receive their winter application of lime-sulphur at winter strength during this month. No other Departmental spray experiments carried on over a series of seasons have shown such consistent results as the trials with lime-sulphur for peach leaf curl. The most extensive of these experiments were carried out at Yanco Experiment Farm orchard.

It was found that the following conditions must be adhered to in order to obtain the best results:—The trees must be sprayed while they are still dormant. The spray must be thoroughly applied to every part, giving the trees a thorough drenching. The lime-sulphur solution should be freshly made and diluted. The lime-sulphur used in these experiments was made and diluted to full winter strength, according to the directions given in the Department's bulletin on "Spraying." In the most recent experiments some other lime-sulphur mixtures were used, and though they gave satisfactory results they were not quite as perfect as the Departmental mixture.

Bordeaux mixture, if applied when the trees are dormant, will also give a good control over curl, but lime-sulphur is preferable, as it also acts as a check on San José scale.

Peach Freckle and Rust.

It should be borne in mind that this winter treatment for curl will also check freckle, rust and shot-hole on peach and other stone fruit trees, and although it cannot be claimed to give an absolute control, as in the case of curl, it generally delays the development of these diseases to such an extent as to render them comparatively harmless.

Scale Pests.

As already stated, lime-sulphur acts as a check to San José scale, but during pruning trees are often found badly infected, having escaped detection earlier. Such trees are more satisfactorily treated with one of the miscible spray oils. As it is necessary, where the scale is thickly coating the limbs, to give a drenching spray (which on large trees takes a quantity of spray and a resultant pool of oil spray about the trunk of the tree when completed), it is advisable to take the following precautions :—First, spray the butt or trunk of the tree to catch any scale that may be there; second, throw in soil round the butt of the tree in order to catch the spray which runs down from the branches; third, give the remainder of the tree a thorough drenching spray; fourth, when spraying is completed, throw the soil which has soaked up the spray away from the butt of the tree into the centre of the rows. In bad cases this treatment has been carried out early in the winter, and the trees given a second light spraying with oil just at end of winter. Although the Department has used miscible oils for both aphis and scale on peach trees without causing injury, cases have been brought under notice where the use of such oils on peach trees was said to be fatal.

Mussel scale can also be dealt with by miscible oil, but the mixture should be used in the proportion of 1 to 15 of water by volume, in place of 1 to 25 of water by volume.

Agricultural Bureau of New South Wales.

Suggested Subjects for Bureau Meetings.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion:—

Is fallowing part of your farm practice; and, if so, what proportion of your cultivated area do you treat in this way? How many times do you find it profitable to cultivate the fallow, and at what time in the year do you first work it? Indicate the special advantage that leads you to continue to practice fallowing.

What, in your opinion, are the reasons for the drift from the country to the city? On your own farm do you adopt any particular method of retaining the interest of your boys in rural pursuits, and what are they? Do you think it is the special attractions of city life that are responsible for the movement; and, if so, do you see any directions in which rural life could be made more attractive?

What steps do you take for the control of insect pests among the vines in the spring? Elephant beetles, borers, cutworms and vine mites demand constant vigilance at this time, or damage may be done from which the vines will hardly recover during the season, and each pest must be met in its own way. Describe your methods, and say in particular whether you have tried poison-baits for cutworms, and with what success.

In the manuring of the orchard do you apply the whole of the nitrogen in the form of blood and bone or dried blood or bonedust, or have you found it any advantage to supply some of the nitrogen in a more quickly available form, like sulphate of ammonia? Similarly, in connection with the supply of phosphoric acid, do you use only the blood and bone or bonedust (slow acting forms), or have you found it any better to use a proportion of the quickly available superphosphate, reducing the other accordingly? What have been the proportions in which these fertilisers have given the best results? Does your experience indicate that you should use potassic manures, and in what form?

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Bobin.

A meeting of members was held on 17th May, when there was a fair attendance. The Chairman continued his lecture on dairying; and the Secretary read an extract on the evolution of the dairying industry, which dealt principally with the by-products.

Clovass.

This branch held the annual meeting on 15th April, when there was a fair attendance. The election of office-bearers for the ensuing year resulted as follows:—Chairman, Mr. G. Long; Vice-Chairmen, Messrs. W. J. Dockrill and J. K. McDonald; Treasurer, Mr. D. B. Lynch; Hon. Secretary, Mr. S. L. Cox. The Treasurer's report showed a credit balance of £9 8s. 6d., which was considered highly satisfactory.

The monthly meeting, on 13th May, was also well attended, and a profitable hour was spent.

Cunningham.

A successful meeting was held on 16th May, when the questions suggested in the *Agricultural Gazette* were discussed by members. In connection with maize grown in the Cunningham district, it was considered that it was very successful some years ago before the closer settlement, Mammoth Dent then being the favourite. Members were unanimous that it did not pay to grow maize, except on alluvial flats or creeks.

A discussion took place on the subject of crossbred sheep for the district.

CROSSBRED SHEEP.

Members were unanimously of opinion that Merinos were not so profitable as crossbreds for the district.

Mr. NEIL HALL favoured the Border Leicester as being the best dual-purpose breed. He recommended spring lambing.

Mr. BARKER spoke highly of Border Leicester and Shropshire lambs, Border Leicester getting preference for wool qualities.

Mr. T. HOBSON drew members' attention to crossbred lambs and ewes getting cast on their back, particularly in wet weather; if not attended to they would die or soon become a prey to crows and hawks.

Mr. B. J. STOCKS strongly advocated Border Leicester as the leading dual-purpose sheep, and favoured autumn lambing, and conserving and growing fodders during the winter months. Early lambs in Sydney were a good proposition. The crossbred ewes had good opportunity after the sale of the lambs to recoup, cut a good sound fleece, and mate early for next lambing. Spring lambing was a gamble, the ewes being in low condition and the lambs cut practically no wool. Grass seeds laid hold of them and consequently the bulk of a spring lambing was carried over to face the risk of another season. No up-to-date lamb-raiser on small assured areas could afford to even shear lambs. To get them early dropped and into the market in the wool ensured best results.

Members remarked that they had had considerable difficulty in getting crossbreds to mate early to ensure an autumn lambing. The last two seasons the whole district was unsuccessful in raising early lambs on account of a poor mating. The result was spring lambing and a heavy carry over to the following season.

DEPARTMENTAL NOTE.—The Sheep and Wool Expert comments that the Border Leicester is always preferable to the Shropshire for mating with the Merino. In fact, the tests which have been conducted by the Department in cross-breeding have gone far to prove that shortwool breeds are unsuitable for mating with the Merino. Their use lies in the raising of an early lamb, particularly suited for export or local requirements; and for this purpose they should be used preferably on longwool x Merino ewes, and then only under conditions where circumstances will permit of the progeny being marketed, if not as "suckers," at all events as "weaners," that is to say, at the 10-months' stage. As to when crossbred ewes should be mated, a knowledge of the predispositional instinct of the different breeds is required. The Merino ewe will join with a ram during practically any season of the year, but in accordance with seasonal conditions certain periods are set apart during which the rams are mated with the ewes. For example, in the dry regions of the west the rams are usually run with the ewes for about six weeks, beginning from the middle of October to the end of November. In the midland districts December and January are the months during which a great number of the flocks are mated, while in the tableland districts, in the generality of cases the ewes are not mated till the autumn.

With pure British breeds, however, the ewes instinctively refuse to join with the rams except during the cooler months of the autumn, irrespective of climate and seasonal conditions, so that so far as these breeds are concerned, spring lambing is unavoidably the rule.

The law of heredity in this disposition, though modified, is well marked in the crossbred. Just in proportion to the preponderance of Merino or British blood in the strain, so is the instinct exhibited to breed correspondingly earlier or later.

Half-bred ewes will seldom copulate before the midsummer, and January and February seem to be the most suitable months during which the rams should remain with them.

Frequently crossbred ewes are mated during spring, with the idea of securing an autumn lambing, as would be possible in the case of the Merino. The lambing results invariably have been disappointing. The deficiency has been attributed to the inactivity of the rams, especially if those employed were pure British breeds. The condition, however, is almost entirely due to the indisposition of the ewe not to mate except during those months to which, by tradition and ancestral environment, they are hereditarily inclined. If the ewe combines, say, three-quarters British blood to one strain of Merino, the natural months for mating would be from about the 1st of February to the end of March. On the other hand, three-quarters or seven-eighths blood Merino could probably be mated to advantage during December and January. These points have been amply borne out in the cross-breeding experiments, which embrace observations taken in different districts with various strains of sheep.

Inverell.

The monthly meeting was held on 9th May, Mr. Arkinstall presiding. The evening was chiefly devoted to the subject of making silage, a paper being read by Mr. J. Ditzell to the meeting, and then discussed at length. Members expressed a desire for further knowledge on the subject of pit silage, in which form they indicated confidence that fodder could be conserved with advantage.

Lidcombe.

At a meeting on 19th May, a paper on spring-flowering plants was read by Mr. S. W. Brown, a number of suggestions being made that interested members

The last subject suggested in the *Agricultural Gazette*, the stamina and physique of poultry, was also discussed. Several members opined that the Langshan was the best utility bird for the district, being most suitable for the heavy soils. The White Leghorn and Wyandotte were regarded as decadent.

On 2nd June, with a large attendance, Mr. R. M. Finch read a paper on the growing of carnations, in which the importance of good drainage and constant cultivation were insisted upon.

Middle Dural.

A discussion took place at the meeting on 16th May in regard to the mixing of fertilisers. The Department was asked for information on the following subject:—Should manures such as bonedust, superphosphate and sulphate of ammonia be mixed any time before being applied to the soil? Would superphosphates and sulphate of ammonia have any ill effects upon the bonedust?

DEPARTMENTAL NOTE.—The Chemist states that the manures mentioned may be mixed together immediately before application, or they may be mixed and stored according to whichever method is the more convenient. These manures have no action upon each other. Lime should not be mixed with bonedust, blood manures or ammonium salts.

Moss Vale.

At a meeting on 15th April, a paper was read by Mr. W. G. Bale, on draining. He said it sweetened the soil, made plant food more available for use, and increased the warmth, thereby encouraging early cropping, and also extending the growing season further into the winter.

Penrose-Kareela.

A successful meeting was held at the residence of Mr. A. J. Bennett during May, some fifteen members being present. The district exhibit of the branch, which had been shown in Sydney, had proved a great success Many glowing testimonies were received to the effect that the display was as fine as any seen in Sydney. Growers felt that the exhibit tended to bring the district before the notice of the public, which was really the objective.

Springside.

This branch held its monthly meeting on 13th May. After disposing of the general business, the following gentlemen were elected office-bearers for the ensuing year:—Chairman, Mr G. F. Giles; Vice-Chairmen, Messrs. James Selwood and T. Commins; Treasurer, Mr. E. H. Selwood; Hon Secretary, Mr. W. P. Scarr. The twelve months' operations closed with a credit balance of £6 18s., which was considered highly satisfactory.

Tingha.

At the monthly meeting of this branch, on 3rd May, the Rev. W. Payne read a paper on beekeeping that was much appreciated. Mr. Payne indicated the profits attached to successful beekeeping, urging that colonies should be kept up in strength. Red gum and yellow box were the best honey-producing trees. The white box that flowered early in the season was also useful for swarming, while shrubs rich in pollen were also desirable. The various types of hives were discussed, the Bolton type being advocated.

Toronto.

At the monthly meeting of 6th May, Mr. Cockburn submitted some fine specimens of cucumbers, 12½ in long and 14¾ in. in circumference. The seed had been imported from America, and promised to be very suitable for local conditions.

A paper on soils was read by Mr. Morriss. The formation of soils from the original rock, under the action of air, water, sun, vegetation, &c., was described, and opportunity was taken to point out the importance of physical condition in relation to moisture-holding capacity and fertility generally, as well as the significance to plant life of the processes of nitrification.

Wellington.

At a meeting on 20th May, Mr. F. A. Kenyon presiding, a paper was read by Mr. C. Rose on the eradication of fowl tick. A number of valuable suggestions were made by Mr. Rose, and a useful discussion followed, in which members exchanged their experiences with advantage to all.

Departmental Note.—Mr. J. Hadlington, Poultry Expert, advises members to be acquainted with the Department's publication on the subject of the tick, and to follow closely the suggestions made therein. The tick must be eradicated from the poultry yard and house, and must not be tolerated at all.

Woonona.

The usual monthly meeting was held on 13th May, but owing to very heavy rain there was only a small attendance. A statement was read by the Treasurer, Mr Geo. Fowler, showing a credit balance of £2 3s. in connection with the recent flower show. The total amount received from the different shows held by the branch was £23 8s.

Mr. Phillip, of Woonona, delivered a very interesting address on geology, the subject being dealt with in a very thorough manner.

Yarrunga and Avoca.

At the monthly meeting on 16th May, Mr. C. Wright gave an interesting address on pig-raising and bacon-curing. The paper urged the growth of fodder crops for the purpose, and mentioned 15 acres, at least, as the area necessary to a good pig farm. A number of questions were asked, and answered by Mr. Wright.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1919.

Society.	Secretary.	Date.
Parkes P., A., and H. Association	G. W. Seaborn	Aug. 20, 21
Forbes P., A., and H. Association	E. A. Austen	,, 26, 27
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 26, 27, 28
Cootamundra A., P., H., and I. Association	N. Gardner	Sept. 2, 3
Corowa P., A., and H. Society	J. D. Fraser	,, 2, 3
Grenfell P., A., and H. Association	G. Cousins	,, 2, 3
Burrowa P., A., and H. Association	W. Burns	,, 4, 5
Narandera P. and A. Association	J. Faulkner	,, 9, 10
Albury and Border P., A., and H. Society	F. J. Belbridge	,, 9, 10, 11
Young P. and A. Association	T. A. Tester	,, 9, 10, 11
Manildra P. and A. Association	A. Anderson	,, 10
Northern A. Association (Singleton)	J. T. McMahon	,, 10, 11, 12
Cowra P., A., and H. Association	E. P. Todhunter	,, 16, 17
Culcairn P., A., H., and I. Society	J. B. Ryan	,, 16, 17
Ganmain A. and P. Association	T. S. Henderson	,, 16, 17
Temora P., A., H., and I. Association	A. W. Ness	,, 16, 17, 18
Canowindra P., A., and H. Association	H. M. Brown	,, 23, 24
Murrumburrah P., A., and I. Association	W. Worner	,, 23, 24
Holbrook P., A., and H. Society	J. S. Stewart	,, 30, Oct. 1
Deniliquin P. and A. Society	P. Fagan	Oct. 1
Hay P. and A. Association	C. L. Lincolne	,, 15, 16
Orange A. and P. Association	W. J. I. Nancarrow	,, 15, 16

1920.

Society.	Secretary.	Date.
Kiama A. Society	G. A. Somerville	Jan. 24, 26.
Ulladulla A. and H. Association (Milton)	R. F. Cork	Feb. 18, 19
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 24, 25, 26
Berrima District A., H., and I. Society	C. E. Wynne	Mar. 4, 5, 6
Armidale and N.E. P., A., and H. Association	A. McArthur	,, 16, 17, 18, and 19.
Royal Agricultural Society of N.S.W.	H. M. Somer	March 29 to April 7.

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OF
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2nd August, 1919.

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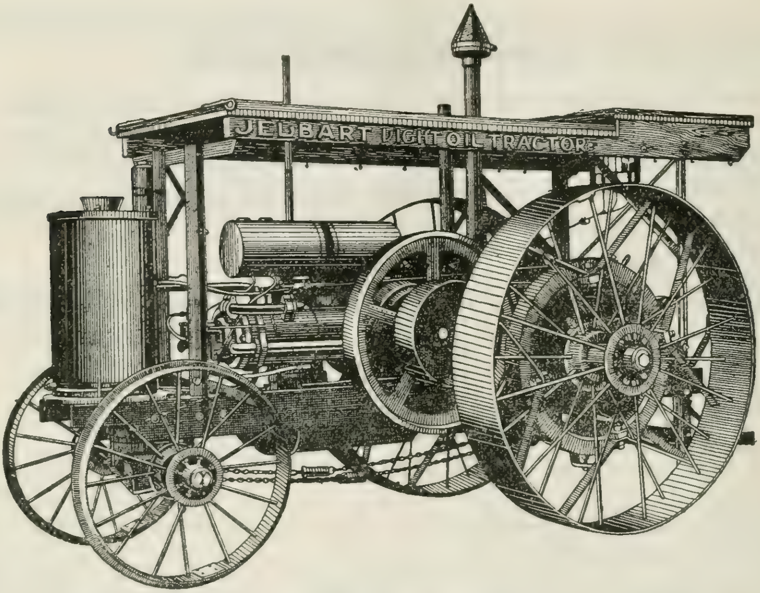

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VOL. XXX PART 8. AUGUST 2, 1919

Agricultural Gazette of New South Wales.

Lucerne for Wheat Farmers.

A. H. E. McDONALD, Chief Inspector of Agriculture.

THE opinion, long entertained by farmers and graziers in western districts, that lucerne will not grow unless water is within reach of its roots, and that it therefore was not for them, has of late years had to surrender to the experience of hundreds of farmers who are proving that on many classes of soils, even on dry uplands, profitable crops can be grown. Indeed, there is plenty of evidence of increasing interest in the subject, even in comparatively dry districts, among farmers who—long aware of its great value as a fodder and of its utility on any farm where it can be established—begin to recognise that a stand of a few acres on their own properties is not an impossibility. Many are actually finding that—carefully planted and handled—stands can be obtained on practically any class of land, and that where the soil is fairly free and well drained, and the rainfall not less than 20 to 21 inches per annum, two and three substantial cuts for hay or green fodder can be obtained each season for several years, and a little light grazing in winter (conditional upon good management) when other green feed is scarce.

Some of its Recommendations.

The fact that lucerne grows during the summer makes it of special value, green feed rarely being plentiful (and frequently scarce) at the time when it is growing most vigorously. Often a few acres under lucerne means the saving of the stock on the farm, and at all times it keeps in good health animals that are allowed a few feeds a week. Many a working horse has been restored to condition, many a ewe pulled through a bad season, and many a milking cow kept in profit in a dry spell where lucerne was available. Hardly any more profitable animal can be kept on the farm just now than the pig; and if green lucerne is available—whether as grazing or as cut green feed—young pigs can be maintained in thrifty growth with hardly any other fodder until they have to be penned up for fattening purposes. Brood sows can be run on lucerne, or fed on it in the yard, and maintained in thrifty condition at a lower cost than by any other system of feeding. Some farmers are finding it pays them best to bring the young pigs to the weaning stage and then to sell them, leaving the fattening to others. The profits that attach to pig-raising just now certainly deserve the attention of every farmer; and where lucerne can be grown it will be found that it is capable of building up good big frames, maintaining vigorous development, and making money for the farmer.

As a means of providing a reserve of fodder lucerne is valuable, and there are farmers who, though not looking for the five and six cuts of hay obtained in a season in the recognised lucerne districts, find that the two and three cuts they get in average wheat country creates, in a very few seasons, a sufficient store to carry them over periods of scarcity. The case may be quoted of a farmer in a north-western district who makes it his practice to gather and store the hay from his lucerne block each year, and who lately was able to carry the full complement of his farm stock through the drought without loss, and with such handsome profits as to amply justify his policy. What is there to prevent thousands of other farmers in the State from similarly protecting themselves from the losses that almost universally—but not necessarily—attach themselves to dry seasons?

Graze with Care.

A warning must be uttered against careless grazing of the crop. Where disappointing results have been obtained from established stands, the cause is generally excessive grazing. Light grazing is not harmful; but if stock are kept on the lucerne for more than a few days, particularly in summer, the sap flows freely from the young stems that have been eaten off, the vigour of the plant is rapidly exhausted, and in a short time the crop becomes so thin that it is no longer profitable. The temptation to graze stock on lucerne when the growth does not seem worth cutting is great, but if it must be done under such conditions, a large number of stock should be put on for a short time, rather than a few for a long time. Where an extensive area is cropped with lucerne for ordinary farm purposes, it will be found a great advantage to subdivide the block into small paddocks which can be grazed in turn and not be occupied too long. In most cases it pays not to graze at all, except in the winter, when it does less harm. Certainly summer grazing should be avoided.

Let it be remembered that a good stand of lucerne is not always obtainable, as the season may not be suitable, but when it has been secured it is well worth looking after as a valuable asset.

Choose Good Soil.

For the same reason—the value of a good stand of lucerne to the farm—it is well worth while to select the best piece of soil on the place—that is to say, the deepest, not necessarily the most fertile and richest. Depth is necessary, because in deep soils the roots develop well and the plants are not so likely to be destroyed by dry weather. In shallow soil the feeding roots are kept near the surface, and the soil there dries out quickly, and with it the plants. Any average wheat land that has a fair depth of surface soil will grow lucerne. Low-lying land, providing drainage can be secured, generally proves very suitable, and every farmer who has such a piece of land could profitably use it in that way. Good drainage is absolutely imperative, however, as lucerne dies where the water remains on the surface for more than a few hours.

A rainfall of 20 inches and upwards is desirable. With less than that the plants make poor growth and die fairly quickly, unless, of course, irrigation is possible. As lucerne makes its growth in the summer, summer rains are distinctly beneficial, and in the north-west, where, as a rule, the bulk of the rain falls in the hotter months, the growth of lucerne can be strongly recommended. It should not be inferred, however, that in districts where the rain falls mostly in the winter, lucerne will not be profitable. As a matter of fact, in many Riverina districts, particularly in eastern Riverina, lucerne does very satisfactorily.

Prepare the Land Early.

To ensure a good start for the crop, the land must be prepared in such a way as to retain a large supply of moisture in the subsoil and to increase the quantity of plant food that is available for plant life when the seed is sown. It frequently happens that after sowing sufficient rain falls to promote a good germination, but it is some time before other showers follow, and many plants either die out or become stunted in growth. The present year, 1919, furnishes a case in point. Rains in May caused a good germination, but since then the weather (to the time of writing, early in July) has been dry, and at present there is danger of the stands being thinned out. If, on the other hand, the subsoil is well supplied with moisture, the roots are encouraged to strike downwards, and the plant is out of danger if a short dry period ensues. Furthermore, lucerne is in danger in early stages of being thinned out by weed growth, and when the roots penetrate deeply and rapidly the plants get such a firm hold of the soil that the harrows can be used to destroy the weeds, which are generally only surface rooted.

The reserve of moisture in the soil can only be created by the adoption of a good system of fallowing. The effect of that operation, too, is to sweeten the soil and to reduce plant food to a soluble and available condition that promotes rapid growth and sturdy plants. Fallowing also tends to destroy many weed seeds, and consequently less trouble is experienced when the seed is sown. This involves that the land shall have been thoroughly cultivated during the fallow. When the land is under fallow, too, the surface can be worked into a fine condition, whereas the surface of non-fallowed land, instead of working into a fine tilth, is hard and dry, and breaks up into large clods that cannot be worked into a fine seed-bed.

The time when the land should be ploughed for the fallow depends on the time of the year when the seed is to be sown. If the autumn is selected for sowing, the fallow should be commenced early in the previous spring as for wheat. Rather more attention should be given the lucerne land than is common with wheat land; but the lucerne is to be a permanent crop and the seed is too expensive to permit of risky methods. If the sowing is to be in the spring the fallow should be commenced in the preceding autumn, preferably in March or April.

The actual preparation of the soil for sowing must be directed towards obtaining a very fine surface, together with a firm seed-bed. Where the fallowing has been satisfactory, a deep ploughing before the sowing is not recommended; about 3 inches to 4 inches is quite sufficient, for deeper working simply turns under the sweetened surface soil, brings ungerminated weed seeds to the surface, and makes it difficult to put the seedbed in the firm condition that is essential. After this ploughing the land should be thoroughly harrowed and rolled to produce a fine surface, and to consolidate the soil generally. A light harrowing should follow the rolling, except in sandy soils, in which cases the seed may be sown on the rolled surface. If the soil is of a heavy character and inclined to set after rain, the rolled surface must be broken or it will probably become very hard after the first rain.

When to Sow.

The time of sowing is determined by the climate and the local weed growth. Generally speaking, autumn sowing gives the most satisfactory results in the west, and is strongly recommended. The autumn sowing produces a crop that becomes well established in the cool winter months, and that stands well the heat and dry winds of the following summer. Spring sown crops do not become so well established before the summer, and are therefore more likely to suffer. The calm weather that is usual in the autumn favours an even stand, while in the spring, variable weather and strong winds are frequent and dry out the surface soil, preventing satisfactory germination. As the seed must be kept within 1½ inches of the surface, favourable weather after sowing is absolutely essential to a good stand.

Under some circumstances, however, the weed growth in the autumn renders sowing at that time unsatisfactory, and if this trouble cannot be overcome spring sowing should be tried. At the same time autumn sowing has so much in its favour that it is worth a special effort to make the weeds germinate early in the fall.

It is generally considered that lucerne should be well established before frosts occur, but our experience has been that unless the frosts are exceptionally severe the young plants are not injured, even when only just out of the ground. The seeds of barley grass, &c., should be encouraged to germinate as early as possible; then the surface should be stirred to kill the weeds, and the lucerne seed sown while the soil is still warm enough to cause germination, a condition that is common even at the end of May.

Where spring sowing has to be carried out it should be made about the end of August or early in September in most wheat districts. On the colder tablelands it should be a little later. The weather is then favourable to germination, but the plants still have an opportunity of becoming established before very hot weather occurs.

The practice of growing a cereal crop with the lucerne—in some cases as a "nurse crop" with the idea of protecting the young lucerne, and in others with a view to getting a return from the land during the months in which the lucerne is yielding nothing—is very unsatisfactory. The objections are more serious than farmers often think, for the strong growing cereal crop interferes with the lucerne, and usually only a poor stand is obtained. In dry seasons the cereal robs the lucerne of moisture, and in good seasons the cereal makes such vigorous growth that the lucerne does not get sufficient sunlight and air to produce sturdy plants, with the result that they feel the shock of the removal of the cereal and take considerable time to recover.

Drilling in the Seed.

In wheat districts where drills are common, very satisfactory results can be obtained by using the machine to sow the seed. The grass seed box attached to the drill is very useful for the purpose, but is not essential, as quite as good work can be done by sowing through the fertiliser box, mixing the seed with fine dry earth, sand, ashes or superphosphate.

To ensure that the right amount of seed is sown per acre, the seed should be mixed with a definite quantity of soil—say 10 lb. seed to 56 lb. soil or superphosphate. To get the machine adjusted to sow the right amount of seed per acre, the drill should be jacked up with the fertiliser gear in operation, and the machine tested by revolving the wheel. The circumference of the wheel should then be multiplied by the number of revolutions made, and the result multiplied by the width of the drill will indicate the area of land that would have been sown had the drill been travelling; the amount of mixture passed out through the fertiliser attachment in the revolutions will be the amount that would have been sown on that area. The distributing gear can now be adjusted to sow the required amount of seed per acre.

There is a tendency for the seed to work to the surface in the box, and not too much mixture must be placed in the fertiliser box at one time.

The tubes should be removed so that the seed mixture falls from the bottom of the box, giving the effect of broadcasting. It is better to remove the hoes or discs, or to adjust the machine so that when the hoes are lifted out of the ground the seed-sowing gear must still be in operation. If the hoes remain in the soil the seed will generally be sown too deep, or it will fall into the drills, and rain may cause a crust to form over it that will prevent the young plants from getting through.

In the above way the seed is sown on the surface, and the light covering that is required can be given by attaching a few brambles to the footboard of the machine. If the seed is sown in dry land, it must needs wait until rain comes to promote germination; but more satisfactory results will generally be obtained by sowing in a moist seed-bed and giving a slightly deeper covering, though in no case should it be more than 1½ inches. In a moist seed-bed a light rolling will promote more rapid germination, but great care is necessary lest a hard crust be formed by rain and the tender plants be prevented from coming through. This can often be overcome with a light harrowing immediately after the rain, but if, owing to the nature of the land, the harrows cannot be put on for a few days after the rain, damage may be done. Whether the harrowing should be done must be left to the farmer's own knowledge of his soil. Though there is distinct advantage in sowing in moist soil, it is unwise to wait too long for rain to come, and it is better in such circumstances to sow in the hope that rain will come soon.

The Quality and Quantity of Seed.

The success of the crop depends more upon the quality of the seed than upon any other single factor. Unfortunately, a certain amount of imported seed finds its way into the State, and in every case in which tests have been made with such seed the crop has been very inferior to crops obtained from seed produced by local growers. Farmers should therefore be very careful to obtain seed from reputable seedsmen, and locally-grown seed should be specified even if it costs a little more. Of the varieties grown here, Tamworth and Hunter River are practically similar in character, while Mudgee lucerne is of a finer type. A good sample of seed should be sound, mature, plump, bright and reasonably even in size; it should contain no dodder nor any weed seed, and if there is any doubt about vitality or purity, a sample should be submitted to the Department to be tested.

Sometimes farmers find they cannot sow seed that they have ordered, and the question has arisen at times as to how long the seed retains its vitality. The Department has tested seed that was known to be four years old, and has found that there was practically no decrease in germinating power. At the same time seed that is known to be of a recent harvest should be given the preference.

The quantity of the seed to use depends upon the soil and district, but in all cases a liberal seeding should be given. It will generally be found that on flats 12 lb. to 15 lb. per acre should be sown, the first figure being sufficient in most cases. If the stand is thin the stalks become coarse, and the feeding value of the lucerne is consequently lower, while in the market the hay commands much lower prices. On higher lands 8 lb. to 10 lb. per acre should be sown, with a preference for the latter quantity. It is very important that a good stand should be obtained in the first instance, as it is practically impossible to remedy a deficiency in this respect by the application of further seed after the crop is found to be thin.

The application of superphosphate when sowing lucerne is recommended for western districts and the Riverina, but is not essential to the north-west. When sowing the seed, 56 lb. of superphosphate per acre will in most soils be sufficient. Experiments at Glen Innes Experiment Farm some years ago indicated that the top-dressing of lucerne with superphosphate is productive of a greatly increased growth, and has led to fairly extensive treatment in this way. Generally 1 cwt. per acre, applied with the drill on the established lucerne early in the spring, is sufficient.

Should weeds become troublesome in the young lucerne crop they may be controlled by simply mowing as often as is necessary, leaving the cut weeds and lucerne on the ground.

Established lucerne can be increased in vigour and in growth by frequent cultivation. The most suitable implement for this purpose is a strong cultivator with set tines. There is no danger whatever of such a machine damaging the plants after they have become established—that is to say, when a few months old. Even the disc cultivator or harrows can be profitably used, provided the discs are set straight. Such cultivation opens up the soil to rain and air, and leads to a great improvement in the crop. It should be given just after the lucerne has been mown.

Haymaking.

Lucerne should be mown just after the first flowers are out. If cut at this time the best hay is obtained, and the succeeding growth is stronger. After mowing care is required in handling to prevent loss of the leaves, which are the most valuable part of the hay. Generally the raking should be commenced at midday to get all the hay cut that day into the windrows before dark.

In very hot, dry districts the rake should be following the mower and the cocking done immediately. In milder climates the hay should remain in the windrows a few hours.

Where the weather conditions make it probable that hay is likely to mould in the cocks, they should be gently turned with the fork.

The time the hay remains in the cock depends on the weather. When it is fine and hot two days are sufficient, but when mild or cloudy it may have to remain four or five days, or even more. Only experience teaches at what time lucerne should be put into the stack. The stems are more likely to be the cause of trouble than the leaves, as they take longer to dry. When handled the hay should have a crisp feel rather than a dead, damp one. If the hay is allowed to become too dry, a considerable loss will occur through the leaves falling, while on the other hand there is a danger of hay which is brought in too fresh firing in the stack; but any farmer with a little experience with hay will find that in a short time he is able to cure a fair sample.

The Cultivation of Boree Country.

G. G. POTTS, H.D.A., H.D.D., Assistant Inspector of Agriculture.

THE extremely weak germination obtained on the Farmers' Experiment Plots (green fodders) on Boree (or crab-holey) country, in the Murrumbidgee Irrigation Areas, directed attention to this class of soil last season, and careful consideration was given to the problems it presents. It is hoped that the following suggestions on soil management, the result of our observations, will prove useful.

In the first place, the soil in question varies considerably in texture, ranging from a heavy clay to a friable loam. Secondly, owing to the undulations, thorough irrigation is a difficult matter, and in view of the fact that the crab-holes remain wet longer than the puffy banks, cultivation cannot be practised at the correct stage; sound judgment must therefore be exercised in determining the most opportune time to proceed with this operation. The effect of grading is not permanent, for the soil afterwards puffs up continually. The practice of constructing check banks to control the applications of water must necessarily receive particular attention to allow of a speedy efficient irrigation and subsequent drainage. Furrow irrigation appears to be ineffective unless deep furrows are employed, and even then it is difficult to obtain satisfactory seepage.

Soil preparation for summer cropping should be commenced the previous autumn, the land being ploughed and left rough throughout the winter months, again ploughed, cultivated and harrowed early in the spring without irrigation, and the crop sown, if possible, in soil damp from natural precipitation. Where irrigation is necessary for a crop sown in the summer, special attention must be directed towards the class of cultivation, for this soil dries out with remarkable rapidity, and although the subsoil a few inches below may be saturated the surface soil is dry. The cultivation must necessarily be shallow. A shallow mulch should be aimed at, and implements used which do not pulverise and throw up to any extent. In the writer's opinion, the disc implements are of no value for summer cultivation on this class of soil—on the other hand, they are a hindrance. The narrow tine cultivators are most suitable, and these, together with mouldboard ploughs and tine harrows, will do the work efficiently. The loss of soil moisture is undoubtedly due to the excessive hot drying winds, and to have the soil in an open cloddy condition accelerates this loss.

The practice of rolling or smoothing the land after sowing compacts the surface soil, thus preventing the entrance of wind, and although a certain amount of moisture is lost by capillary action, yet the contact between soil and subsoil is increased, supplying the seed with moisture until germination is effected. The harrows can afterwards be employed to form a mulch, but the secret of successful cropping on crab-holey country in the summer months is to obtain a satisfactory germination. The subsequent treatment is attended with comparative ease, and the growth is equal to, if not better than that obtained on most of the soils devoted to cropping on the irrigation areas. As an illustration of the benefits derived from compacting the surface soil, the smoother was, in February, run over land sown with barley which had failed to germinate. However, a few days after the smoother had been used a satisfactory germination took place. Experiments on the above lines will be conducted next season on this class of country.

TOP-DRESSING LUCERNE.

THE Department advises top-dressing lucerne with about 1 cwt. superphosphate per acre, applied just before it makes the first spring growth, or after the first cut. It is considered that superphosphate alone is more suitable than superphosphate mixed with bonedust.—A. H. E. McDONALD.

The Breeding of Wheat.

AN OUTLINE OF THE DEPARTMENT'S ACTIVITIES.

J. T. PRIDHAM, Plant Breeder.

THE absence of any historical statement of Mr. William Farrer's work in the cross-breeding of wheat has often been deplored by workers in this and similar fields. The remarkable influence he has had upon wheat production in Australia in the improvement of the average quality of the grain, the increase of the yield per acre, and the extension of profitable cultivation to districts at one time regarded as far beyond the limit of the wheat belt, all attach a notable and enduring significance to his work; but additional to its economic value (which in itself is exceedingly difficult of estimate), his method and its application, as well as the effects from year to year, have a value to students of plant life and of hereditary influence in that sphere that make the absence of information that would be most interesting, and probably very valuable, doubly regrettable. Unfortunately, like many pioneers of research, Mr. Farrer has left the most meagre records. His objectives were indicated in some degree in his correspondence, and in the paper read before the Australasian Association for the Advancement of Science in 1898, but the field books which record the crosses actually made, and in a measure the results obtained from year to year, are very bare of original notes and comments. There is nothing to guide the layman in a perusal of them; one can only read between the lines and draw conclusions.

It is thought that a brief survey of the cross-breeding done by Mr. Farrer in each year would be of value. To have stopped with Mr. Farrer's death, however, would obviously have been to leave the statement in an incomplete condition from the public and from the Department's point of view. Consequently, this review has been extended down to the present time, the effect being to present an account of the Department's activities in the breeding of wheat over a period of 21 years. We may not notice any line of outstanding interest in the opening years, but the objectives did become more definite as time went on.

In addition to the cross-breeding, a considerable amount of selection was done year by year, and a great many varieties, notably from France, the United States and India, were imported and tested from time to time. Through the agency of the American Bureau of Plant Industry, too, many varieties from all parts of the world have been received for testing.

It was in the spring of 1898 that Mr. Farrer became an officer of the Department of Mines and Agriculture, being appointed to carry on at his own farm, "Lambrigg," the work that he had been engaged upon there as a private pursuit for the preceding eleven or twelve years. The work that had already been done by Mr. Farrer in breaking new ground and testing varieties from many sources was necessarily of great value, and the Department, in succeeding to the knowledge already thus acquired, was enabled to commence its activities with the sphere and the objectives in an important degree already defined. Mr. G. W. Norris was Mr. Farrer's first official assistant, being also located at " Lambrigg."

The Farrer Period.

In this first season of 1898 seeds were sown from the produce of 138 crosses made the previous year. Of these, 91 were crosses on selections from Blount's Lambrigg, which is a late maturing wheat of the Fife class, though the grain is not quite equal to that of the Fifes in quality. Other parents included combinations between Purple Straw varieties, Indians, Fifes, Durums, Poulards, and a spelt-rye-wheat hybrid. In 1897 Allora Spring and White Lammas had been crossed with Yandilla, and the F^1 seed was sown in 1898. Varieties from Russia, England and Egypt also figured in the pedigrees. It was in 1898, too, that the crossed seeds were sown which produced Thew—still a valuable wheat for the coastal districts.

Seeds resulting from 209 crosses were sown in 1899, the chief parents used being Indians in 46 cases, and Jonathan in 41. Nutcut was used as a parent in 18 crosses, Yandilla and Durums in 8 each. Among other parents were Fife-Indian crossbreds, White Essex, White Lammas, Australian Talavera, Purple Straw, Jade, Federation (or 14 A x Yandilla), Allora Spring, Eden, Comeback and Dragoon. A large number of unfixed Fife crossbreds were grown as in previous years, and imported varieties from various countries, especially Indian, were under test.

Experiments were made with various treatments for bunt, including bluestone pickling (afterwards drying the seed in lime), washing in several changes of water, and soaking in formalin solutions. A good many crossbreds were forwarded to Sydney for examination in the Departmental mill.

In 1900 seeds from 286 crosses were planted. Of these, 37 crosses had Jonathan for a parent, 58 Early Lambrigg, and 32 Fife. Some French, English and American wheats were crossed, mostly with Fife and Fife-Indian stocks. In many cases a composite crossbred was crossed with another wheat, also the product of numerous crossings, the whole making a formidable pedigree. Steinwedel, Dart's Imperial, Golden Drop and Farmer's Friend were employed as parents, but the progeny was later rejected for susceptibility to rust. Red and White Lammas and Nonpareil were employed chiefly for their value as hay wheats. Bobs, Blount's Lambrigg, Australian Talavera and Federation were used among others as parents.

The fungicide experiments for bunt were continued, and a few crossbreds were heavily infected with the spores before sowing, to test their relative degree of resistance to the disease. A collection of wheats from Persia was also sown, and, as usual, a good many Indian sorts.

Seeds from 247 crosses, of which 73 were crosses with Fife wheats, were sown in 1901. Most of the crossbred parents were Fife-Indians; 23 crosses were made with Jonathan, 15 with Indians, 13 each with Lightloaf and Dart's Imperial, 17 with Gunner, 10 with Punch, 8 with Federation, and 5 with Purple Straw; among other parents were Bobs, Langshan, Cleveland, Russian and Fife-Purple Straw crossbreds.

A large number of F^2 generation crossbreds, as well as crossbreds of a later generation and established varieties, were infected with bunt with the object of securing an immune variety. The experiments with various fungicides were continued, the counting of diseased and healthy plants entailing much labour, as at least two close inspections had to be made before recording the final counts for each plot. Some seventy Indian varieties and selections were sown. It was in the winter of this year (1901) that the writer was appointed assistant to Mr. Farrer, Mr. Norris being transferred to Sydney, where he has since done the milling of experimental and other wheats with the miniature milling plant under the supervision of Mr. F. B. Guthrie.

Seeds of 245 crosses made in 1901 were sown in the next season (1902). Of these, 69 were crosses with Fifes, 19 with Persians, 17 with Rymer, 12 with Purple Straw, 11 with Indians, 11 with Federation, 8 with Nonpareil, 7 with Australian Red Lammas, 6 with Australian Talavera, 5 each with Jonathan and Lambrigg White Lammas, and 4 with Langshan. Several successful crosses were made with Emmer to provide a suitable parent to correct shattering. As is well known, the Emmer wheats hold their grain tightly.

The bunt experiments were continued as in the previous year. The severity of the drought this year made it necessary to water the F^1 crossbreds so that good seed should be formed; no seed was lost, except a head or two by the depredations of parrots, which were very persistent. It was a common practice in hybridising to use an entirely unfixed crossbred as a parent, usually in the second year from the cross, relying on the constitution of the crossbred, as represented by the average of its component strains, to reproduce itself.

No less than 395 F^1 crossbreds were sown in 1903, Fife being the parent in 109 cases, Durums in 37, Indians in 33, Jonathan in 13, Emmer in 11, and Russians in 20; 7 wheats were crossed with *T. monococcum*. The pollen of Skinless barley was introduced into two wheat heads without success. The reciprocal cross of wheat on barley was tried, and a number of seeds obtained. These, when sown next year, gave rise to plants, some of which much resembled wheat in their young stages, but as they grew the likeness steadily diminished, and ultimately they could not be distinguished from the barley mother sown alongside. In 1901, Mr. R. J. Hurst, at Wagga Experiment Farm, had obtained seed from a cross of naked two-row barley on Federation wheat. This appeared different from its mother variety in the F^1 generation, and in the F^2 generation it gave rise to many variations. But for the weakness and the tallness of this straw all of these, however, might have appeared in the process of fixing the variety Federation. No other resemblance to barley appeared. We are growing several selections from this cross, and they are all remarkable for the rather weak character of the straw, and in almost all cases for the superior quality of the grain to that of Federation. The latter variety is noted for the stiffness and strength of its straw.

In the bunt experiments, the crossbred, afterwards named Florence, gave 83·33 per cent. healthy plants when the seed was thoroughly infected before sowing, and the original Cedar gave 74·70 per cent. clean. These experiments now began to occupy the greater portion of the area sown, all new crossbreds being subjected to the bunt test.

Seeds from the 298 crosses made in 1903 were sown in 1904. Those from the *T. monococcum* parent turned out not to be true crosses. Of the others, 43 crosses were on Fife, 100 with Durums, 16 with Gluyas Early, 10 with Russians, 10 with Skinless barley at Wagga, 8 with Indians, 6 with Bobs, 6 with Jonathan, 5 with Cleveland, and 2 with Turkey. About this time Durum flour was being introduced for blending in America. Mr. Farrer was an advocate for the use of Durum wheats for macaroni, as well as for breadmaking, and he set about trying to produce an awnless variety. Though this was accomplished, it has since been found that this class of grain does not yield so well on the average here as the ordinary bread wheats. Durums are grown as spring wheats in the United States of America, whereas autumn sowing is necessary here to obtain the best results. If millers paid a premium for this sort of grain, and did not object to its extreme hardness, there would probably be a market in the country.

In the bunt section, Florence gave 85·71 per cent. of clean plants, and Cedar 91·46 per cent.

In 1905 the produce of 288 crosses was sown, among which 33 had Florence for a parent, 35 Fife, 39 Durums, 22 Birlong, 11 each Russian and Pigmy, 9 Jap, 8 Rymer, 6 Yandilla, 6 Bobs, 4 Redskin, 3 each John Brown and Barletta, 2 Gluyas Early, 2 Turkey, and 1 Karkov. The free use of Florence and Birlong parents was suggested by their high resistance to bunt. Pigmy, Jap and Yandilla were employed to reduce the height of straw on the assumption that a variety with a short straw would put more of its energies into grain formation than one with tall straw, and that a short straw wheat is well suited for the stripper. In a drought, however, length of straw is needed to afford hay if grain fails, and our experience shows that there is no correlation between productiveness and shortness of straw, though Federation is rather an exception.

Florence gave 86·58 per cent. clean plants, and Cedar 41·30 per cent. in the bunt immunity tests in this year.

Mr. Farrer's death occurred in April of the following year, and an indication of his aim in wheat breeding may be inserted here in his own words:

> "I am engaged in an effort to make varieties, or strains of varieties, to suit all the districts of our interior—the hottest and driest included—and to produce grain which, in grading, can be placed in either the one or the other of two distinct classes:

"(1) Varieties with all the characteristic excellences of the very best of the old South Australian sorts, but yielding stronger flour;

"(2) Varieties which are equal to the very best grown in Minnesota or Manitoba in flour strength, but with mellower grain and of better appearance."

It can readily be imagined, from the number of crosses made each year, what an immense store of crossbred wheats had been accumulated at this stage, and how bewildering was the task of selecting the best for propagation and further breeding. This was the more difficult as yields had not been systematically recorded, the quality of the grain having been considered to be of prime importance. Rust resistance had been kept in mind in all Farrer's work; in fact, this quality and bunt resistance, as well as capacity for drought resistance, were tests that crossbreds had to pass before being selected for planting again.

Post-Farrer Work.

In April, 1906, Mr. G. L. Sutton was appointed to succeed Mr. Farrer as "Wheat Experimentalist," with the writer as his assistant.

Seeds from 156 crosses were sown, together with 8 received from Mr. R. Marshall, of South Australia. Mr. Marshall's crosses were various combinations of Jonathan, Bobs and Comeback. Of the others, 20 were with Durums, 9 each with Bayah and Bobs, 6 with Federation, 9 with Indians, 5 with Gluyas Early, 2 each with Jap, Comeback, Yandilla and Nutcut, and 28 with Fife. A collection of Mexican wheats was sown, and experiments in oat breeding were this year transferred from the Bathurst Farm to Cowra, which now became the principal breeding station. Including 3 crossbreds, 8 varieties were received from Professor Biffen, of Cambridge University, England, and 16 from Mr. Carleton, of the United States Department of Agriculture.

The bunt experiments were carried on very extensively as in 1905, Florence showing 96·90 per cent., and Cedar 95·14 per cent. of clean plants respectively.

No F^1 seeds were sown in 1907, it being felt that there was now sufficient crossbred material in hand to carry on with until a definite policy had been arrived at.

The bunt experiment plots were sown as in 1906, Florence showing 99·47 per cent. and Cedar 98·96 per cent. clean plants. Genoa also was equally bunt resistant. In making choice of parents for sowing, their relative resistance to bunt infection was made of first importance, but wheats which appeared from their pedigrees to be undoubtedly good yielders were also sown.

Seeds from 96 crosses made in 1907 were sown in 1908, 58 being from Durum varieties, which had been crossed mainly with ordinary wheats, with the object of determining whether their progeny behaved similarly to that of the reciprocal cross, which had also been made in each case. The chief parents used were Florence, Johnny, John Brown, Jonathan, Bobs, Warren, Cedar, Comeback, Jap and Federation. An experiment was made with several varieties to test the value from a milling point of view of grain harvested (1) at the milky or soft dough stage; (2) at the firm dough stage; and (3) when dead ripe.

Florence gave 97·18 per cent. and Cedar 100 per cent. clean plants in the bunt tests. In the winter of this year the writer left to take up breeding work with the Victorian Department of Agriculture.

In 1909 seeds from 41 crosses made at the Wagga Farm were sown. Among these 11 were with Federation, 7 with Cowra White Lammas (a good hay wheat), 7 with Cedar, 6 with Thew, and 5 with Durums.

In the bunt section Florence produced 97·20 per cent. and Cedar 99·85 per cent. clean plants. The milling experiment, testing grain at different stages of ripeness, was continued.

In the year 1910 seed of 70 crosses was sown, of which 36 were made at Wagga, and the rest at Cowra. The chief parents used were Comeback in 16 cases, Durums in 12, John Brown in 8, Bobs in 9, Jonathan in 7, Cedar in 6, Warren and Florence in 4 each. Several wheats of a weak-flour type, such as Plover, were crossed, with the object of improving the grain in quality. A large number of crossbred wheats, nearly all awned, were received from Algeria, and grown for trial.

The milling and bunt experiments were continued, Florence in the latter yielding 88·30 per cent. clean plants, and Cedar 91·04 per cent. Some 16 new wheats from America were also sown this year.

In March, 1911, the writer returned from Victoria, being appointed Plant Breeder. It was in this year, too, that Mr. Sutton went to West Australia. Seed from six crosses was sown, and selections from four of these were saved: Cedar x John Brown, Cedar x Jumbuck, Comeback x Medeah, and Oures-Algerian variety x Comeback. Seed was also grown of eighty-seven varieties of six-row barley received from Algeria in the previous year. Some fifty varieties and strains of Indian wheats grown in 1910 were sown, and oat-breeding experiments were resumed. The milling and bunt tests were continued, but the area of the latter was curtailed. Florence showed 81·57 per cent. and Cedar 92·33 per cent. clean plants.

In 1912 seeds from 164 crosses were sown, 13 of these having been made at Wagga. In 27 cases one parent was Federation, in 27 Comeback, in 16 Indians or Indian crossbreds, in 9 English wheats, in 7 Federation x naked barley, in 10 Yandilla, in 7 Yandilla King, in 5 Jonathan, and in 3 Palestine wild wheat (*T. dicoccum dicoccoides*). The bunt experiments were not continued, as an immune variety seemed unlikely to be secured, though a high degree of resistance to bunt was found in certain wheats. It had also become apparent, ere this, that a large number of productive varieties were being destroyed because of their failure, more or less, to withstand the disease.

It was considered that the milling experiment had now been continued long enough to decide the point at issue. The results indicated that there was no advantage from a milling point of view in harvesting wheat grain before maturity, and it is certainly more economical for the farmer to leave it until quite ripe, when it can be taken off with stripping machinery.

With the object of introducing better grain quality into wheat-flour crossbreds and other varieties, seeds of 84 crosses were sown in 1913, Comeback being a parent in 55 crosses. Two of these crosses were crosses with wild wheat, and two with wild barley *(H. spontaneum)*. One new oat cross was sown. A small experiment to test the prevention of flag smut was carried out in connection with the Bureau of Microbiology. Federation is found to be one of the varieties most susceptible to flag smut. The proportion of grain to straw was determined for the principal varieties and crossbreds, but this was found to bear no direct relation to the yield. Most early varieties had a high ratio, while hay wheats showed a relatively low proportion as a rule. This quality is not of such value as a factor for selection with wheat as it is in connection with barley, where the straw is of very little value, harvesting being effected before the crop is dead ripe and ready to lodge.

In 1914, seeds from 25 crosses were sown, 4 of them being oats. Among the rest 4 wheats were crossed with Yandilla, 3 with Fife, and 2 each with Indians and Marquis. In 1913, at Cowra, two strains of Federation had been crossed, and at Bathurst 2 strains of Cleveland, to see if first generation hybrid seed is as vigorous with a self-fertilised plant as in the case of other plants, such as maize, in which cross fertilisation largely takes place. The yield of the Federation cross was seen to be less than that of selected Federation seed sown alongside. At Bathurst the results were:

Plot 1—Cleveland, 1 lb. 10¾ oz.
Plot 2—Cleveland x Cleveland, 1 lb. 4¾ oz.
Plot 3—Cleveland, 1 lb. 13 oz.
Plot 4—Cleveland x Cleveland, 1 lb. 7¾ oz.

There appears, therefore, to be no advantage in using first generation crossbred seed of wheat, but rather the reverse where selection is carried out.

Seeds from 25 wheat crosses and 1 oat cross were sown in 1915. Of the wheat, 7 were with Warren, 3 with Federation, 2 each with Hard Federation, Gluyas Early, Indians and Hawkesbury No. 3, and 1 with Thew. A good many selections from the crossbred Yandilla King x Zaff were tested. This wheat shows a high percentage of grain to straw, matures early, and yet yields well, the grain being of good quality. The straw is rather weak. The effect of the policy of producing fewer crosses was by now becoming apparent, but it should not be thought that either the area of the plots or the total number of strains under observation showed any diminution. On the contrary, the field of investigation was steadily increasing and widening. Fewer crosses were now being made, but that very fact enabled each to be much more thoroughly tested than in the past, a greater number of selections being made than Farrer was able to find space for on the same area. As Nilsson-Ehle says, unless we have a wide field for selection the ideal plant may not be found.

Most of the crosses with Comeback made two seasons before had now to be rejected for indifferent yielding qualities.

In 1916, seeds of 38 crosses were sown, of which 8 were with Yandilla King x Zaff, 5 each with Steinwedel and Federation, 4 with Thew, 3 each with Firbank and Bomen, 2 each with Sussex, Nyngan No. 2, and Huguenot. Banner oats were grown this year, and a large number of selections from Yandilla King x Zaff, preference being given to plant mothers with a high proportion of grain to straw. In the stud variety tests, six plots were sown of each variety at intervals, with Hard Federation as a check in each tenth plot. Varieties giving inferior yields for three seasons, as a rule, are rejected. Weighings with bulks of Yandilla King x Zaff show that the gross yield is not always in direct proportion to the yield of grain. Were this so, it would greatly simplify the work of determining the most productive wheats. Gross yield, however, is a safe enough guide in dealing with different strains of one variety that closely resemble each other.

In 1917, seeds from three wheat and two oat crosses were sown. The wheats were Cowra 15 x Cowra 19, Hard Federation x Cowra 19, and Salter's Hard Federation x 114 Hard Federation. Over 1,300 plots were occupied with selections from the crossbred Federation x Cowra 15. Besides oats and barleys, peas were introduced in some F^3 generation seed received from Mr. H. Wenholz, B.Sc. (Agr.). The plan was adopted this year of sowing the varieties of cereals to be tested in triplicate in a series, with a buffer variety in every alternate plot. Reasonably uniform conditions are thus secured for determining yielding qualities. Seven varieties bred by Mr. Howard, of India, were grown.

In 1918, only 3 F^1 crossbreds were sown, viz.: ([Bredbo x Wild Wheat] x Yandilla King) x Hard Federation, and Federation x ([Bredbo x Wild Wheat] x Hard Federation), and the reciprocal of the latter cross. A number of variations, in some cases natural crossbreds, were grown; 20 were from Hard Federation, 10 from Yandilla King, 4 from Sunrise oats, and 1 from Ruakura oats. New oats from France and Algeria were also planted, 112 plots sown with (Cowra 15 x Cowra 19)^2, 680 with selections from (Federation x Cowra 15)^4, 32 plots with strains of ([Yandilla King x Zaff] x Bomen)^3, and 47 with those of (Dreadnought x [Cleveland x (Rymer x Bunyip)])^5. Take-all was prevalent, and counts were made of the number of affected plants in all wheats grown in the variety tests. No wheat was found to be immune, but short-season early-maturing varieties were most free from the disease.

In the present year, 1919, arrangements have been made to sow seed of 18 wheat and 7 oat crosses; of the wheats, 11 were with Yandilla, and the balance with Clarendon. Crossbred seeds were also received from Mr. E. E. Salter, of Wellington, and Mr. J. Sands, of Currabubula.

Some of the chief sections this year are:

186 plots, sown with selections (Hard Federation x Cowra 19)^3.
128 plots, sown with selections (Cowra 15 x Cowra 19)^3.
125 plots, sown with selections (Federation x Cowra 15)^5.
101 plots, sown with head-to-row selections of Hard Federation from the field.

From the Agricultural Departments of Victoria, South Australia, West Australia and Queensland, 42 new varieties have been received.

The wheat stud variety trial this season occupies 732 plots. It is not difficult to raise new varieties which yield heavily, but to pursue Farrer's policy they must also be of high milling quality, in other words, strong flour wheats. This combination of qualities we have not yet attained, and our experience goes to show that to some extent we have to sacrifice quality of grain in order to ensure high yields. Our aim to-day, therefore, is to produce a satisfactory yielder with medium strong flour, such as Hard Federation. We have been endeavouring to reduce the number of wheats grown, and to perfect the few élite varieties. Sports and natural crossbreds are found to furnish much useful material.

Crossbreeding plus Selection.

Farrer stated that, " if the Department acted with caution, and was careful to distribute and encourage the growth of none but varieties of high milling excellence, the prospect of the wheats of this State taking the very highest place in the markets of the world is not remote." This suggestion the Department has not been able to act upon, because high grain quality does not command a correspondingly enhanced price, and we have been obliged to cease recommending varieties such as Cedar and Comeback, which take the prizes, it is true, on the show bench, but do not fill bags sufficiently well to pay the farmer who grows them.

Reviewing the list of wheat varieties recommended to farmers at the last Departmental Conference, we may classify them thus:

Produced in Farrer's time.—Comeback, Bomen, Bunyip, Cleveland, Canberra, Federation, Firbank, Florence, Rymer, Sunset, Thew, Warren.

Post-Farrer production.—Hard Federation.

From outside sources.—Haynes' Blue Stem, Zealand, Huguenot, Marshall's No. 3, Yandilla King, Improved Steinwedel.

Varieties selected for further trial may be classified thus:

Farrer wheats.—Sunset, Genoa, Clarendon.

From outside sources.—Currawa, Major, Warden, King's Red, King's White, Roseworthy.

If we compare this list with Farrer's objectives as defined in the quotation on page 544, we are fain to admit that we may not seem to have got far, but it has to be borne in mind that, outside of this, his " effort to make varieties, or strains of varieties, to suit all the districts of our interior—the hottest and driest included," has acquired an increased significance, and that concurrent with flour strength the Department has had yielding capacity more and more definitely in view. The effect of this policy cannot be better illustrated than by mentioning the popular varieties—Federation, Bomen, Hard Federation and Canberra. All four represent endeavours to combine the farmer's demand for wheats that crop well with the miller's demand for flour quality. If we limit ourselves to Farrer's two classes, only Bunyip, Florence and Hard Federation can be included in his class for varieties possessing the best characters of the old South Australian wheats, but yielding stronger flour, while Comeback is the only one that could be included in his class for varieties better than the Minnesota or Manitoba sorts.

As indicated in the foregoing review of the work of the past twenty-one years, however, cross-breeding is not the only means by which plant improvement can be secured. Contemporary with it there must go on a process of consistent selection which aims at separating or subjecting to observation those individuals that seem to promise some return for the devotion of time and attention to them. That this has been the tendency especially of the past few years is quite in accord with the methods that have latterly been adopted in other parts of the world. Reduced to figures, and compared one season with the next, the improvement may appear slight, but that it is real and to the advantage of those engaged in wheat-growing is hardly deniable. Two evidences may be quoted—the forgotten talk of six or seven years ago about the deterioration of Federation, and the appearance of the new strain, Hard Federation. The greater popularity of other varieties recommended by the Department for special purposes is further proof of the altered conditions that have resulted, not from cross-breeding, but from something closely allied to it, and essential to its success, viz., improvement by selection.

The tendency of the work of the last few years, in fact, can hardly be better illustrated than in Bomen and Canberra. Both crosses were made in Farrer's day, but it was only after years of consistent selection to the desired type that they were placed before farmers. That the time spent upon them before they were made available for distribution was well spent, every farmer who has grown them will admit. Bomen for its dual value as a hay and grain wheat on the western slopes and in the Riverina, and Canberra for its capacity to produce a heavy crop of grain in very short time, both testify the importance of selection to definite objectives for years after the crosses have been made.

The average quality of New South Wales grain to-day is above that of other States, and the reason is largely Farrer's resolve to aim high—to produce wheats of conspicuous excellence among the wheats of the world. If in his own day and since many arrows have flown above the target, we may at least claim to have about found the range. By patience and perseverance we may (to change our figure) maintain our standard—perhaps even improve upon it.

TOWARDS the end of August, bench and other nursery grafting can be proceeded with, but it is better to wait till the sap is flowing more freely before top-working established trees.—W. J. ALLEN.

A Handy Lick-trough for Sheep.

L. JUDD, Stock Assistant, Glen Innes Experiment Farm.

A SUITABLE receptacle for holding licks in the paddock is an essential to the economical use of those useful supplements to the pasture. It is possible for considerable quantities of a lick to be wasted by the sheep if the trough be not of a good design, and exposure to the weather may result in the deterioration of still more. The trough figured in the accompanying plan has been in use at this farm for several years, and has given very satisfactory results, and it can be recommended to the attention of farmers. Experience with it shows that the contents of the bin are at all times kept dry, and even in the trough they are practically protected from rain.

The contrivance consists of a covered bin which carries the store of lick, and a trough or feeder below. An opening at the bottom of the bin, running the whole length, allows the lick to fall automatically into the trough, though the quantity is checked when the trough becomes full. A constant supply is thus maintained before the sheep, so long as the bin is kept supplied. The iron covering overlaps the bin on each side, and affords ample protection to the bin and a certain amount to the trough.

The centre of the trough is placed directly under the opening in the bin, and a few inches from it. The trough is 2 inches deep, 12 inches wide, and the length of the bin, viz., 8 feet 6 inches. The sides of the trough should be roughly dressed to prevent splinters giving trouble with the sheep.

The trough can be easily transported from one paddock to another, though it is not advisable to move it when full, as the timber may be strained. The design permits of it being filled quite easily. A nut at one end is unscrewed, to allow the batten holding the iron to be swung round, and the iron covering withdrawn. Care must be taken not to overfill the bin, or the lick will come in contact with the iron and cause corrosion.

The simplicity of the design makes its construction an easy matter, and it is thought the accompanying plan supplies sufficient detail for anyone with even a meagre knowledge of carpentering. Two men can complete two in a day with little experience.

The total cost, including the timber, bolts and labour, is £1 2s. 7d., but on account of the present very high price of roofing iron, good sound sheets of bark can be used with advantage, provided no second-hand iron is available. The cheapness of the trough, coupled with its efficiency, should commend it to practical men.

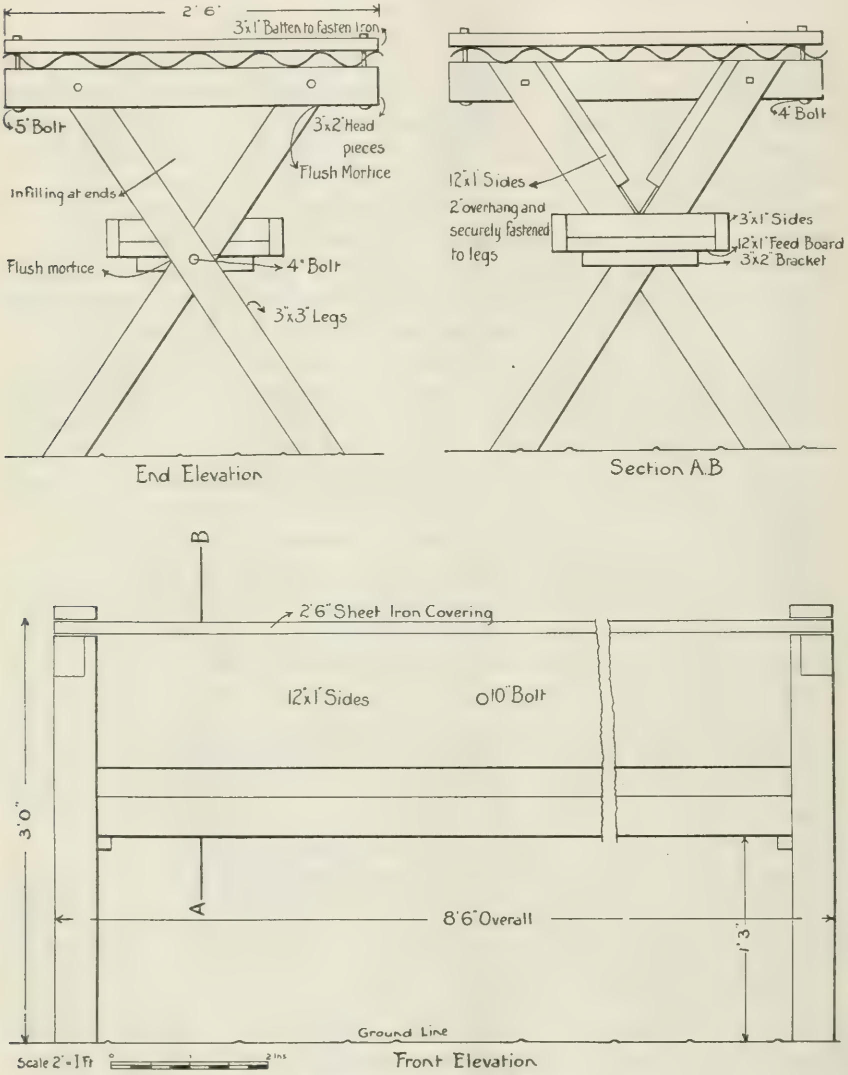
The following are the quantities of material required:—

Hardwood Timber.—1 length, 12 feet, 3 x 3, for legs; 1 length, 8 feet, 3 x 2, for headpieces and brackets; 2 lengths, 10 feet, 3 x 1, for sides and end of trough; 1 length, 6 feet, 3 x 1, for top fasteners; 2 lengths, 9 feet, 12 x 1, for sides of bin; 1 length, 10 feet, 12 x 1, for bottom of trough and ends of bin.

Iron.—1 length, 8 feet 6 inches, by 2 feet 6 inches wide.

Bolts.—6 bolts, 6 inches by ½ inch; 4 bolts, 4 inches by ½ inch; 2 bolts, 10 inches by ½ inch.

Nails.—¼ lb., 3 inch; ¼ lb., 2 inch.



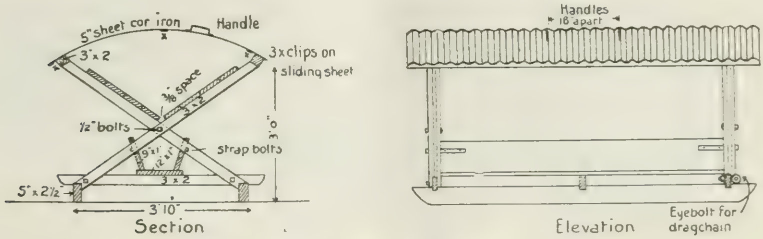
A Handy Lick-trough for Sheep.

It is thought the accompanying plan and specification for an alternative trough supplied by Mr. J. W. Mathews, Sheep and Wool Expert, might be of use to some sheep-farmers. The plan is by Mr. A. Brooks, Works Overseer.

In general mode of construction, the two designs are almost identical, except for the fact that in the second, the cross pieces, which form the basis of the framework, have a wider spread, which correspondingly adds greater width to the storage bin.

A slight difference is also to be noted in the covering. Whereas in the Glen Innes design the roof is flat, that of the second is slightly curved, and the corrugations, instead of running lengthwise, run crosswise.

The tray that catches the salt as it trickles through the opening from the bin above is deeper, and being placed on the framework forming the lower half of the cross section is nearer the ground.



Section

Elevation

A Trough of another Type.

The material of which the type designed by Mr. Brooks is constructed, it might also be mentioned, is lighter, and as the whole framework is built upon skids, it can be drawn from one paddock to another as required.

Specification.—Can be made of hardwood frame, bolted together as indicated in plan, ends of the trough to be trenched into the legs and strap-bolted with 1½ x ¼ inch strap-bolts with ½ inch bolt ends passing through the legs. Two eye-bolts at one end to take the trace hooks of the drag chains. Hopper over trough to be of 6 in. x 1 in. pine, T. and G. boards, with ⅜ inch space along the bottom to allow salt to fall into trough below. Ends of hopper to be closed in with similar boarding across the outer face of the legs. On the roof, provide a movable sheet made to slide over with three strong hoop-iron clips on each side underneath the sheet and fixed as indicated by X on section plan, so that the sheet will slide over one way only. Also provide two ⅝ inch round galvanized iron handles bolted to the curved sheet.

NATIVE PLANTS SUPPOSED TO BE POISONOUS.

THE Wild Onion (*Bulbine bulbosa*), which belongs to the Lily family—see this *Gazette* for 1895, page 242—has again been reported as suspected of having poisoned sheep. In the aggregate this plant has been reported a good many times.

Dichopogon Sieberianus, another member of the Lily family, also with tubers, and a near relation to the so-called Wild Onion, has been also reported as a poison plant Four years ago it was sent to us from Cowra Experiment Farm as causing "yellows" in sheep, and the suspicion is revived by recent correspondence.—J. H. MAIDEN.

Selecting and Judging Maize for Show.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

THE selection of maize for show purposes is understood by a few experienced men who have found that the small amount of time and trouble, over and above that necessary to the choice of good seed, is amply repaid by their successes. The primary object of the competitions at an agricultural show, or any other fixture of the kind, should not be the money value of the prize (though this is sometimes made a consideration), but rather the honor and reputation a grower can derive from his success. In itself this will create a demand for the seed which he is able to supply, of course, at an enhanced and profitable price. An exhibitor who has not this latter object in view is not doing useful work for the farming community, and he is losing an excellent opportunity for himself.

In this connection there are a few matters that agricultural societies might consider when framing their schedules of classes for maize at their shows. To begin with, there still persists at many country shows a class for the best collection of maize varieties. Now, maize differs from most other crops in being difficult to keep pure, owing to the readiness with which cross-fertilization takes place. All the successful efforts at improvement of this crop within recent years have been in the direction of ridding varieties of the impurities brought about by cross-fertilization, and it is distinctly disheartening to see these societies (unconsciously, perhaps) undoing that work by encouraging the growth on one farm of many varieties, some of which are not suited to the district, and probably all of them crossing promiscuously. Good varieties are thus in danger of losing their identity, their suitability to the conditions, and their reputation as high yielders in the very district in which they should be grown. Winners of prizes for several varieties of maize in a show should be avoided by purchasers of seed, or at least regarded with suspicion, until the farm has been inspected to see what precautions are being observed to keep the different varieties pure. On small farms on the coast it is almost impossible for a farmer to grow pure maize of more than two or three varieties.

Following on this there should be a corresponding limit to the number of prizes which can be won by one exhibitor in the maize section at any show, especially if the classes are for different varieties of maize.

The judging of maize, or rather the selection of the judge, also calls for some comment. In too many cases the writer has observed that the judge has awarded the prize to the best commercial sample of grain rather than to the best sample for seed purposes. The fault in this case is chiefly that of the Association in selecting as judge a commercial agent who handles only

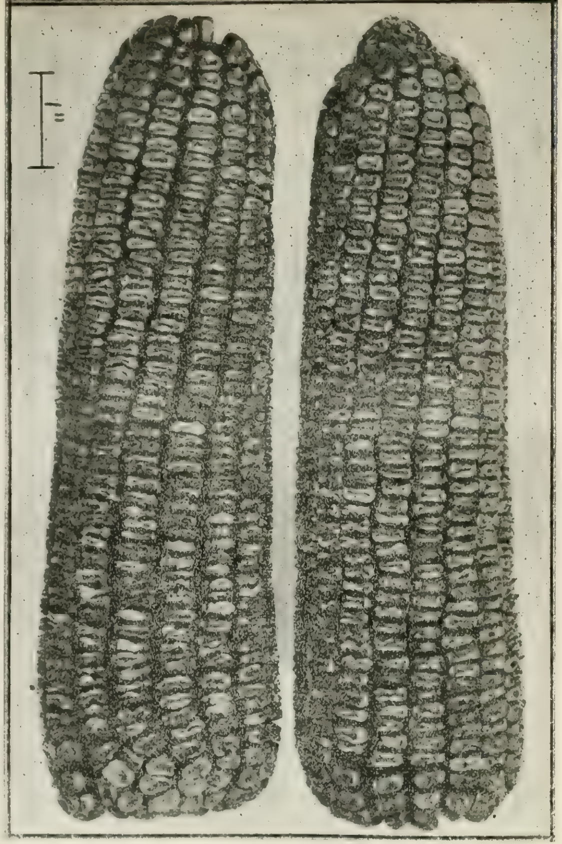


Fig. 1.—Weight in proportion to size.

These ears of the same size and maturity have a difference of 5 oz. in weight.

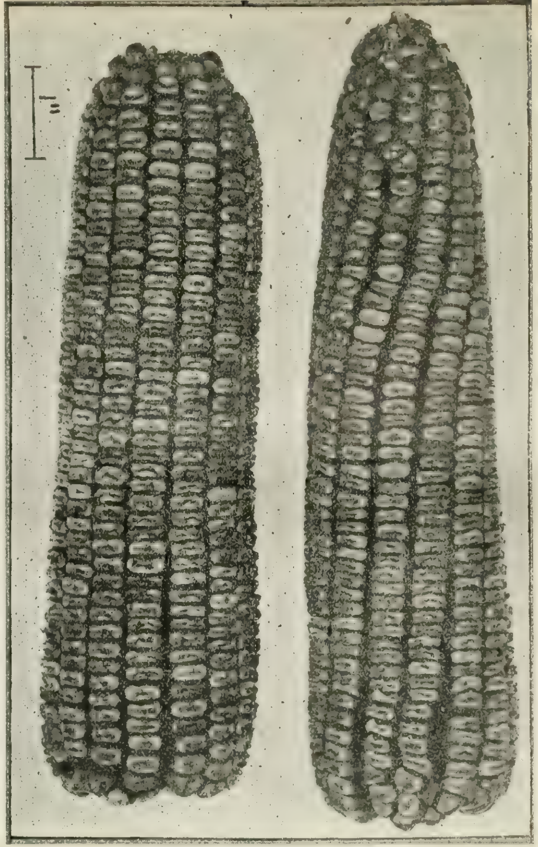


Fig. 2.—Cylindrical and tapering ears.

Cylindrical ears carry more grain of uniform regular size than tapering ears.

grain, rather than a farmer whose business it is to know something of the value of a sample for seed purposes. Some of the most shocking judging (especially of maize on the cob) the writer has seen has been done by commercial men, whose efforts clearly indicated that they did not possess the slightest knowledge of the elementary principles of what constituted a good seed-ear; nor can they be expected to if they have never handled an ear of maize. Only farmers and others who have spent hours and hours in the barn or in the field picking ears for seed can be considered competent to judge maize ears for show, for when ears are exhibited they should be judged for their value as seed-ears—not for the sample of marketable grain they will shell. The exhibition of shelled maize grain is a different matter. This can be well judged by a commercial man for its marketable value.

For this reason it would be better to have separate classes for maize ears and for shelled grain, and not to have grain and ears shown together, as is still done in some cases. This recommendation has been adopted by the Royal Agricultural Society in its maize schedule.

The judging of maize ears should be an attempt to give first place to the exhibit which is the best seed maize, *i.e.*, the maize that will produce the highest yield of the best quality. It may be easily possible in many cases to make correct awards without the use of a score card, but where the competition is very keen, the score card is the only sure and practical method of judging satisfactorily. Where the score card is not used, the points to be considered in selecting and judging maize for show are well worth careful study.

The Score Card.

Just as with stock, it is coming to be recognised that there are certain visible characteristics in plants which indicate high performance. Experienced dairymen have many ideas in common regarding the type of a cow they would buy for a good milk-yielder, and in a similar manner maize ears have been studied and correlations formed between type and yielding capacity. Although this study is by no means complete, sufficient progress has been made in it to enable a score card to be prepared for judging maize ears and seed. In some cases the value of these points as indicators of high yield alone, has been over-emphasised, but the question of quality has also to be considered. Moreover, the score card can only be based on the best of our present knowledge, and cannot be regarded as the best for all time. Further scientific and practical investigations may render revision necessary at any time.

The score cards given below for maize ears and for shelled grain represent, in the writer's opinion, the best obtainable at the present time for conditions under which maize is grown and shown in this State. Other score cards have been used and found unsuitable—especially some of American origin—mainly because the climatic conditions are so different as to affect certain characters in different ways.

Another main point of difference between the score card given below for maize ears and those of other countries is the omission from ours of points

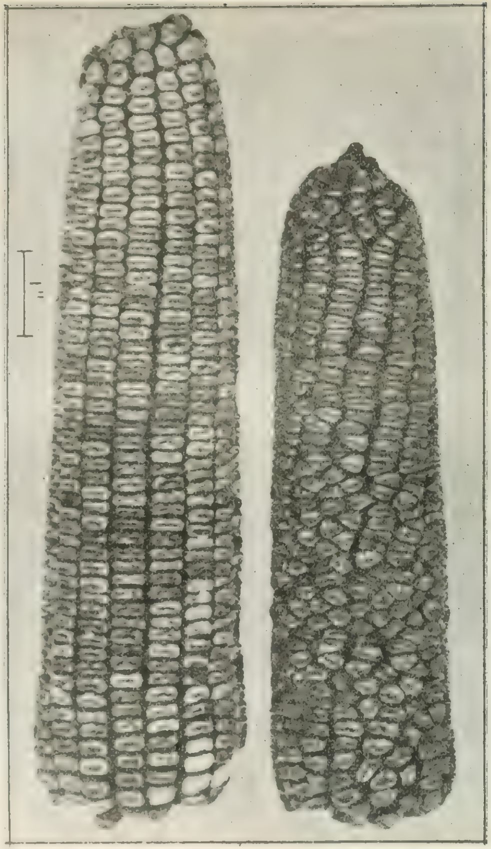


Fig. 3.—Regular and irregular rows of grain.

Irregular rows cause irregularity in size and shape of grain.

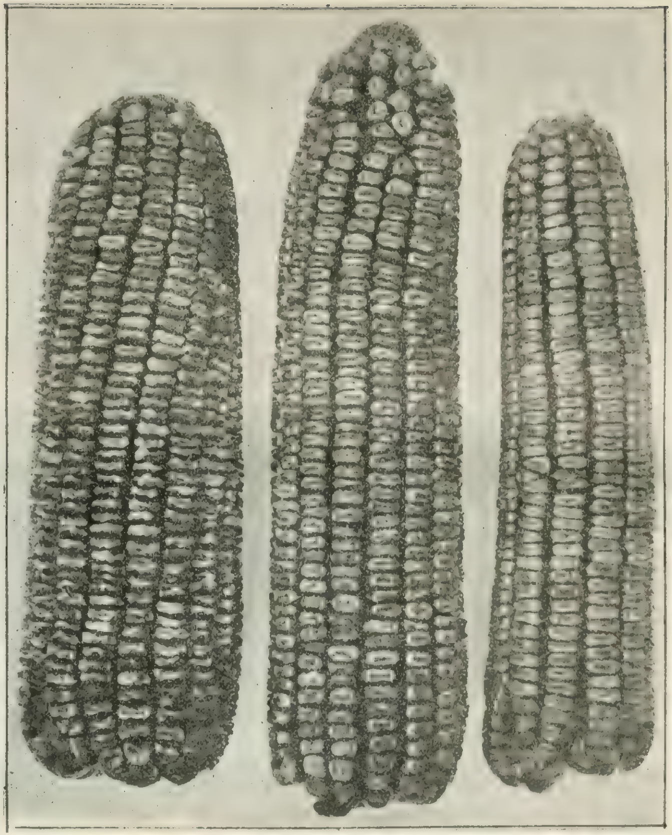


Fig. 4.—Thick, moderate and thin cores.

Too thin a core does not carry enough grain, while too thick a core prevents quick drying of the ear.

for the proportion of shelled grain per ear. In most of the American score cards 10 points are given for the percentage of grain—those exhibits scoring highest which have a high percentage. This is usually determined by shelling five ears in a ten-ear exhibit, but a good judge with much experience can determine fairly accurately the shelling percentage of any ear by consideration of such points as depth and density of grain, size and density of core, maturity, shape of ear, filling of butts and tips, and space between rows and grain. Apart, however, from the inconvenience and spoiling of the exhibit for show when half the ears are shelled, the exhibit has already been scored for these points, and it is difficult to see why a repetition should be made, even if it is found that a high percentage of grain per ear is correlated to a high yielding capacity in the progeny. As far as can be ascertained no definite results to prove this correlation have yet been found, and its insertion in the score card seems to be based on it being an easily discoverable factor.

In his book, "Corn," Bowman states that the purposes of the score card are as follows:—

1. To present to the mind of the student, judge and grower, the essential points to be considered in examining an ear or sample of maize.
2. To impress the relative value of these points, placing first those of the greatest importance.
3. To explain and illustrate, as much as possible, just what these points mean.
4. To go even further and point out the reason why these points mean so much.

In order, then, that the score card might serve its true purpose, it is essential, firstly, that the cards be shown alongside each exhibit with the points allotted by the judge, and, secondly, that the judge or some competent person should give an explanation of the meaning and importance of the points on the score card to those who are interested.

Judging Maize Ears.

The following score card for maize ears is suggested on the basis of our present knowledge and experience in this country:—

TABLE I.—Score Card for judging Maize Ears.

1. Length and weight of ear	10
2. Shape of ears and regularity of rows	5
3. Trueness to type	10
4. Uniformity of exhibit (size, shape and appearance of ears and colour of core)	10
5. Butts, well covered and rounded	5
6. Tips, well covered and rounded	5
7. Colour of grain (shade and brightness)	5
8. Length and density of grain	10
9. Space between rows and grain...	10
10. Uniformity of grain (size, shape, colour and dent) ...	15
11. Shape of grain	5
12. Market or seed condition	10
Total	100

1. *Length and Weight of Ears.*—Bearing in mind that the exhibit is to be judged for its value as seed, *i.e.*, its ability to produce high yield and quality, the variety should be taken into consideration in giving the points for length of ears. If the exhibit is up to the variety standard, it may get full points, whether the ears average 8 inches or 10 inches in length, according to whether the variety is an early or a late one. The judge should know the variety characters, &c., in this respect, and this is where the ordinary commercial man cannot give satisfaction. It is important that the ears should be heavy in proportion to their size when dry. This character is gauged by rough estimation of the weight in the hand.

2. *Shape of Ears and Regularity of Rows.*—Points should be deducted for marked taperingness of ear, as well as for too noticeable curving, dropping and irregularity of rows. A core of moderate size is the most desirable, and deductions should be made for cores of excessive size, as well as for too thin cores, taking into consideration, of course, the nature of the variety.

3. *Trueness to Type.*—Ears must be true to the type they are supposed to represent, just as with defined breeds of cattle or other stock. This is necessary in order that the variety should not lose its identity.

4. *Uniformity.*—Ears should be uniform in size, shape, appearance and maturity, and also in colour of core. Ears with red or yellow grain should have a red core, and white grain a white core, and the inclusion of cores of a different colour should lose all points for uniformity, unless it be a variety characteristic. Yellow flint varieties usually have a white core.

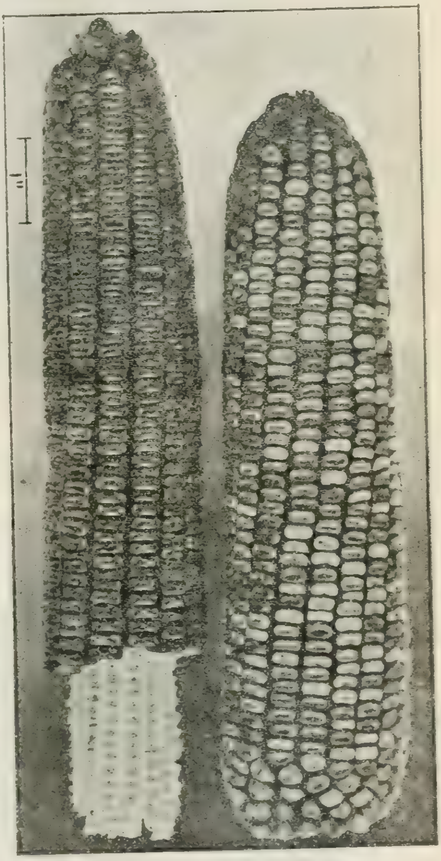


Fig. 5.—Evidences of Impurity.

Ears with yellow grain should have a red core, and should not contain white capped or white grain.

5. *Butts Well-Covered and Rounded.*—The grain should extend regularly round the butts, and a fair depression should be seen. Flattened butts are not an evidence of good breeding. Open and swollen butts are also objectionable.

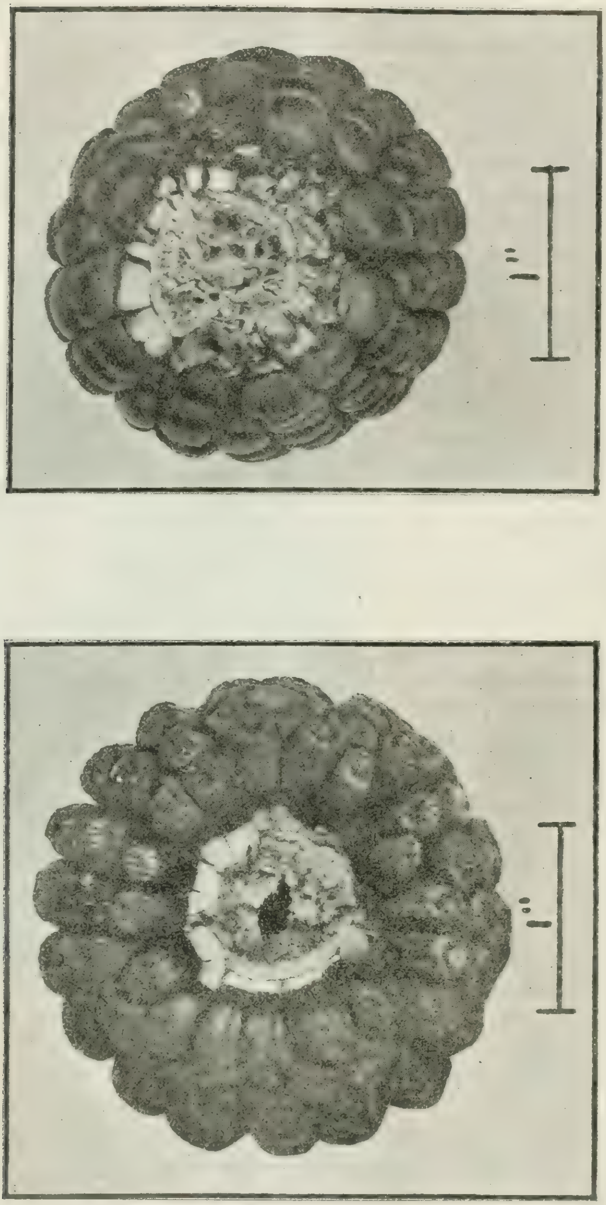


Fig. 6.—Well filled and poorly filled butts compared.

(A) A well-covered and rounded butt carries a lot of extra grain.

(B) A poorly filled flattened butt means loss of grain, and does not indicate good breeding.

6. *Tips Well-Covered and Rounded.*—In a show sample it is desirable to have the tips of the ears well filled and rounded. Long pointed tips and double or divided tips are undesirable.

7. *Colour of Grain.*—The grain should be of bright colour, indicating freshness and good quality, and in the case of red varieties not too dark a shade.

8. *Length and Density of Grain.*—Length or depth of grain is a desirable feature, but density or "weightiness" of the grain should also be taken into account. Short horny grain may weigh heavier than deep starchy grain, and it is weight that counts.

9. *Space between Rows and Grain.*—Wide furrows between the rows usually give a lower weight of grain on the ear, but the furrows should not be so close as to prevent the ready drying of the cob. Space between the tips of the kernels at the cob indicates immaturity, weak constitution and poor feeding value, as well as low weight.

10. *Uniformity of Grain.*—The grain should be uniform in size, shape, colour and dent. This is a most important factor with the present state of impurity of the varieties of maize in this country.

11. *Shape of Grain.*—The best grain should be wedge-shaped, full tipped and thick.

12. *Market or Seed Condition.*—The grain should be dry, sound (free from insect or other damage and fungus disease), sweet, plump, bright and firm on the cob. It should have a large germ of bright and oily appearance, and be free from blistering.

(*To be continued.*)

SILAGE PITS ON THE BLACK SOIL PLAINS.

"CAN silage pits be made satisfactorily on the black soil plains, as the soil cracks badly when dry?" asked a grazier in terms only slightly varied.

The reply furnished by the Chief Inspector of Agriculture was to the effect that the black soil plains are suitable for silage pits, provided flood-water can be prevented from reaching the pits. The silage mentioned in the *Agricultural Gazette* of April, 1919, was made at Coonamble from crops grown on black soil; but a slight rise that provided good ground for most of the pits was available. If a site cannot be found which is out of swampy places or is not subject to flooding, pits cannot be recommended. The cracking of the soil itself would not be very serious, but the pit must be protected from water.

A good heavy natural growth of suitable herbage, such as trefoil, would be suitable for silage. The only crops likely to prove satisfactory are wheat or barley sown very early—say, about the end of February or during March. Barley is recommended, as insects frequently damage the seed wheat in the ground before it germinates. Summer crops, like sorghum or maize, cannot be recommended, as they make poor growth without irrigation.

Farmers' Experiment Plots.

POTATO TRIALS, 1918–19.

Lower North Coast.

J. M. PITT, Assistant Inspector of Agriculture.

VARIETY and manurial trials with potatoes were conducted by the Department with the co-operation of the following farmers during the spring and summer of 1918-19:—

J. C. Duff, Somerset, Mount George, Manning River.
J. W. Smith, Wauchope, Hastings River.
J. G. Ward, Sherwood, Macleay River.
O. Collins, Comboyne.
A. M. Singleton, Mundrook, Manning River.
M. Smith, Paterson, Paterson River.
J. G. Perrett, Miller's Forest, Hunter River; and
G. H. Hodges, Yarramalong, Wyong.

The yields ranged from exceptionally good along the Northern Rivers to light around the Hunter and its tributary. The Department were fortunate in having experimentalists who, besides being keen enthusiasts, gave the plots every attention. One farmer, Mr. J. C. Duff, gained the second prize offered by the Manning River Agricultural and Horticultural Association for plots of potatoes grown in the district, his entry being a section of the experiment. Under circumstances that made the achievement very creditable, Mr. Singleton gained third place in the same competition with the Up-to-Date plot.

Considering that the season was one of the driest (if not the very driest) experienced on most of the lower North Coast, the yields, especially on the Hastings and Manning Rivers and at Wyong, are quite noteworthy, and prove that the effect of dry spells can, to a certain degree, be moderated by good cultural methods.

Potatoes are not a crop that can be "slummed in" anyhow, nor planted in any old paddock, nor left to look after themselves if best results are desired. Some farmers are emphatic that newly-broken land is the only soil suitable for potatoes on the coast. Whether that be so or not they will not grow anywhere—the soil must be suited to them; and if it be a new or old paddock, sound cultivation methods must be used. The plot should be under preparation a year or more beforehand, and should be worked on a rotation with legumes or the like. This and fallowing have a marked influence over subsequent yields. In view of the fact that the early summers of the last few years have been comparatively dry, all preparatory operations should aim at the conservation of moisture. This, together with early sowing, was the main factor in securing such good yields on a number of the plots last year, the farmers reaping a greater reward than would have been the case had their methods been less up-to-date.

All the plots were planted under excellent conditions. In addition to good seed-beds, the seed used was good and germination, with slight exception, was even. Growth was favourable everywhere, but was rather deceptive as to yields. For instance, whilst the top growth of Early Manistee at Paterson was quite as luxuriant as at Mount George, the yield at the latter place was over 9 tons and at the former almost nil, the result of a total absence of moisture at the critical time.

The following table shows the distribution of the rainfall. Whilst the totals in a few instances appear ample for all moisture needs of a crop, they were really not so, on account of the falls occurring only in small lots, which the drying winds and hot weather that followed rendered practically useless.

RAINFALL for Growing Period.

	Mount George.	Wauchope.	Sherwood.	Comboyne.	Mundrook.	Paterson.	Miller's Forest.	Yarramalong.
1918.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
August ...	...	74	...	...	*30	...	...	...
September ...	239	171	127	20	386	361	320	...
October ...	258	185	165	273	78	172	124	59
November ...	61	80	92	169	193	90	90	123
December ...	*120	*100	164	280	*100	11	28	16
1919								
January ...	...	...	...	500	...	*75	...	*100
Totals ...	678	610	548	1,242	787	709	562	298

* Signifies part of the month.

Cultural Notes.

Wauchope.—The soil at this centre was a heavy loam, rich and typical of the river flat lands along the Hastings.

The previous crops were potatoes in the spring and pumpkins in the summer of 1917–1918. After the removal of the pumpkin crop the land was ploughed deeply and allowed to remain in fallow until August, when it was again ploughed, disced, harrowed and rolled. This preparation ensured an almost perfect seed-bed for sowing on 15th August, the sets being dropped in drills 3 feet apart and 15 inches apart in the drills. They were afterwards covered with the cultivator. Up-to-Date, Carman and Surprise came through very evenly, the others irregularly. A harrowing as soon as the rows could be seen was given to break any crust that had formed and to destroy weed growth. That this procedure was beneficial was amply proved upon comparison with the untreated plots. As growth progressed a cultivation was given, followed by another at hilling time, and still another some weeks later. Irish blight made its appearance early in October, and a spraying with Bordeaux mixture was given, followed by another application a few weeks later. The treatment, together with the dry, hot weather, prevented further development. Only two useful falls of rain—both under an inch—were recorded between germination and digging time; the only effect the second fall had was to encourage a little second growth. As will be seen from the appended table, Up-to-Date, Manhattan, Surprise, Factor and Carman all yielded well, the honours resting with the first-named. In the manurial trial, although it was quite a common occurrence to dig up fertiliser, plots having an application yielded heavier than the unmanured plot, that treated with 2 cwt. of P7 showing an increase of over 2 tons to the acre, which, at the price obtained, was equal to between £30 and £40. Mr. Smith had no difficulty in disposing of the crop at an average price of £16 per ton after marketing expenses were paid.

Potato Plot at Mr. G. H. Hodges' farm, Yarramalong.

Mount George.—Although a fairly good loam, the land selected for the trial was inferior to the best potato land along the Manning; besides, it had grown maize for a number of years previously. By deep ploughing in the autumn and working the fallow (ploughing again in July, harrowing and rolling and further ploughing, harrowing and rolling previous to sowing) a large amount of moisture was conserved and a splendid seed-bed prepared. On 31st August seed and manure were dropped by hand in drills 3 feet apart, the sets averaging about 15 inches apart in the drill. The scuffler and harrow were used for covering.

All varieties germinated well with the exception of Satisfaction. The harrow was run over the crop early, and the cultivator between the rows once before hilling and twice after. Considering that no rain of any value fell after September the yields are excellent. Up-to-Date, Early Manistee and Carman were the most satisfactory yielders, the first, with an application of 2 cwt. of the mixture P8, giving 9 tons 18 cwt., which, besides being the heaviest yield on the coast, was 1 ton 4 cwt. above the yield of the unmanured plot. The area treated with 2 cwt. of the mixture P7 was very little inferior in yield, upholding the reputation gained on the other farms. More fertiliser was dug up on this farm than on any of the others. Mr. Duff disposed of his crop at £14 nett per ton. Although the crop was apparently free from blight, two sprayings were given as a preventive during the early stages of growth.

Potato Plot at Mr. J. C. Duff's farm, at Mount George, Manning River

Sherwood.—This experiment was carried out in accord with the idea prevalent in the district that best yields are only to be obtained from potatoes planted in new land; as to whether the popular belief is correct could not be proved, none being planted on old worked land. Considerable labour was required to get the plot into good order, the site selected being a paddock that had been down to paspalum for over twenty years; but by ploughing early in April, discing half-a-dozen times, then cross-ploughing in July and keeping the land further worked until sowing time, an excellent seed-bed was prepared. Planting took place on 2nd September, the sets being ploughed in at the same distances as those previously mentioned. The varieties were sown without manure, and all save Early Manistee came away well, Factor deserving special mention. After sowing, the operations consisted of a harrowing and two cultivations before hilling. As only 384 points of rain fell, chiefly in light showers, during September, October, November and December, there was little wonder that fertiliser was dug up with the potatoes.

Newly-ploughed pastures, especially those where the soil has become matted with grass roots, &c., as a rule contain so much organic matter that the soil is apt to remain too open or loose, thus encouraging a certain amount of drying out. Under these circumstances, one could not expect better yields. Digging took place on 2nd January. Factor easily outyielded the other varieties, Up-to-Date being next. In the manurial trial with Manhattan the heaviest yield was obtained from the mixture P7 at 3 cwt. per acre. Mr. Ward received an average of £16 per ton for those marketed. The attacks of ladybirds and of fusarium wilt were most noticeable at this farm.

Wyong.—In comparison with districts such as the Macleay and Manning, the area of good agricultural land around the Wyong district is fairly limited, being situated chiefly along the creeks and towards Yarramalong. They are, on the whole, comparatively new areas, fairly rich, and mostly suitable for potato culture. The soil received a good preparation, as the following details will show:—After the removal of the maize crop grown the previous summer, the land was deeply ploughed in July, disc-harrowed in August, and fallowed immediately by the tine harrow, which implement was used again early in September and still again after another disc-harrowing at the end of the month. These operations aimed at the conservation of moisture and the destruction of weed growth. A further ploughing and harrowing preceded the planting, which took place on 11th October—really too late for the district. The sets were ploughed in at the usual distances. After germination was advanced sufficiently to distinguish the rows a harrowing was given. The germination could have been better, Manhattan probably being the worst. Two cultivations were given during growth, both in November. Considering the abnormally low total of only 298 points of rain between sowing time and the end of January, the yields are remarkable and probably constitute a record under such dry conditions. A little early blight made its appearance during December, but caused no serious ill-effects. The yields on all plots were very even, excepting Manhattan, there being a difference of only 12 cwt. between the remaining eight varieties. Up-to-Date gave the highest yield. In the manurial trial with this variety the plot treated with 2 cwt. of the mixture P7 yielded 2 tons in excess of the no-manure plot, equal to an increase in profit of well over £30, after deducting the cost of the manure. Another point worth noting is that, while probably 50 per cent. of the tubers in the no-manure plot were unmarketable, practically all in the manured plot were good marketable types. Mr. Hodges disposed of the greater part of the crop for £18 per ton.

Miller's Forest.—An old lucerne paddock was selected in this case, the land being ploughed during February. The soil was typical of the rich alluvial flat lands of the Hunter. A second ploughing and a rolling were given in June, and another in August prior to planting. As regards the preparation of a seed-bed, nothing better could be desired. The sets were ploughed in on 28th August and the germination was good. The plot afterwards received a harrowing, and a cultivation was given after the heavy rain in September and another in October. Growth continued favourable, and the plot, when inspected in November, looked quite equal to the others; but after September the district went through one of the driest periods known, and this, with the extremely hot conditions, prevented the tubers from becoming much larger than hens' eggs. Manhattans gave the heaviest yield from a plot manured with 2 cwt. of P7 mixture, being about 2 cwt. ahead of the unmanured plot.

Paterson.—Similar conditions to those at Miller's Forest prevailed at Paterson, and although every attention was given to the selection of the site, preparation of the soil and after-cultivation, the results were even more disappointing, Early Manistee failing altogether. The plot on which the variety trial was sown had grown potatoes in the autumn, and was ploughed twice, disced and harrowed a number of times before planting took place on 12th and 13th September. The manurial plot was sown on an old lucerne bed, and was treated similarly to the variety plot as regards preparation.

The soil in each section was of a dark, rich, alluvial nature, and had any useful fall of rain occurred during the last quarter of the year, good results would have been obtained, for the top growth and the number of small tubers were favourable.

Mundrook.—This experiment was sown on 23rd August on one of the richest alluvial farms to be found on the Manning River. The portion selected for the trial had been cropped previously for a number of years, chiefly with maize. After the harvesting of the maize crop in the autumn, the land was deeply ploughed in June, and again in August immediately before sowing, a harrowing following the latter operation. The potatoes were dropped in drills 3 feet apart with 15 inches between the sets in the drills, and they were covered with the scuffler. Germination was good, the bed being harrowed when the plants were well up. A scuffling followed about the middle of September and another at the end of the month, the crop being hilled in the same operation. The early growth was rapid. A little early blight made its appearance, but not to any great extent. Although no late blight was present, a spraying with Bordeaux mixture was given about 11th October and repeated about 2nd December. After the November rainfall second growth took place among the Factors, and to a greater degree among the Carmans, both lots being dug and disposed of locally. The Factors, besides giving the heaviest yield, turned out some excellent tubers. In the manurial trial with Manhattan, all the manured plots gave yields up to half-a-ton in advance of the unmanured section. Mr. Singleton had no difficulty in disposing of the crop locally at the ruling market rates, which were up to the average obtained by the other growers.

Comboyne.—This experiment was carried out under conditions totally different from the other trials. The Comboyne is situated about 2,500 feet above sea-level, and the soil is of the richest volcanic nature. Although situated at such an altitude the temperature in summer often goes into the 90's. Still the season is short, frosts are experienced earlier and later than on the lower-lying areas, and consequently only one crop of potatoes is possible. The rainfall is unusually high, averaging over 70 inches for the past six years; but droughty conditions prevailed last summer, although ample rain fell to suit the potatoes. It was noticeable that at this farm the difference between the manured and unmanured plots was more marked than elsewhere—due to plenty of moisture being present throughout growth, and the fertiliser therefore dissolving to a greater degree. Previous to the potatoes the land had grown a crop of maize, and after the harvesting of it in the autumn the land was twice ploughed and harrowed three times. The potatoes were ploughed in on 26th September in an excellent seed-bed. Sowings can with safety be made at least three weeks earlier, however, for the worst of the frosts are over, and the earliest sowing for the district invariably gives the best results. After germination, which was very fair, the operations consisted of a harrowing and two scarifyings. Blight did not make its appearance. Growth continued satisfactorily throughout, and although the crop was not dug until the autumn, and heavy rain fell at the end of the year, very little second growth took place.

U-to-Date was far superior to the other varieties, giving some excellent tubers. A few of the Carmans rotted after the heavy rains, and considering the water-holding capacity of the soil it is a wonder more did not do so. The mixture P7 proved the most profitable manure, an application of 2 cwt. giving the remarkable increase of 3 tons 8 cwt., or equal to over £40 to the acre. Mr. Collins disposed of his crop locally for prices similar to those obtained elsewhere.

Varieties.

Up-to-Date, a white-skinned variety, which has given excellent results in past years, again produced the heaviest yield. Besides being very prolific, it is an excellent cooker, and the percentage of waste in peeling is very small owing to its shallow eyes. Owing to the eyes being few, it does not lend itself too favourably to cutting for seed purposes.

Factor, said to be an improved Up-to-Date, also yielded well. Its characteristics are certainly similar. A little second growth was noticeable, chiefly on the Mundrook plots.

Early Manistee, a reddish, smooth-skinned variety, having eyes slightly deeper than the above-mentioned and more numerous, germinated well only on two plots, the seed being of poor sample. It is a good cooker and worthy of further trial; has given good yields when sown in the early autumn; matures in about four and a half months.

Manhattan, a widely-grown, mottled and bluish coloured variety, produces tubers that grow to immense size. The tubers under one hill are few, but they are all marketable. The eyes are fairly shallow, although the eyelid is prominent. Grown on some soils, it cooks rather soapy. The best yield was obtained at Wauchope.

Carman No. 1, a whitish-skinned variety, with tubers oblong and flat, is a vigorous grower and yielded well in several centres. It makes vigorous top growth. At Paterson it grew very "stringy," and at Mundrook took a good deal of second growth. It is a good cooker.

Surprise, a rather late maturing variety, with roundish tubers, pinkish in colour, and with few and deep eyes, yielded very well at both Wauchope and Sherwood.

Satisfaction, an early-maturing variety that has been grown for a number of years, having round tubers of a light-pinkish colour and few and shallow eyes, yielded fairly well on most of the plots.

Coronation, a bluish-coloured, roundish variety somewhat resembling Manhattan, and maturing in about five and a half months, yielded poorly at the only two places tried, but so did the other varieties, owing to the dry season.

Brownell's Beauty, a pinkish-coloured, round-shaped variety that has been grown for a number of years, has eyes somewhat deep. The tubers are few, but large. This variety gained first prize in the Manning River Association's competition for the best plot in the district last season with a yield of over 11 tons—a very fine performance considering the unfavourable season.

Results of Potato Variety Trials, Lower North Coast, 1918–19.

Variety.	Mount George.				Wauchope.				Sherwood.*				Mundrook.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Up-to-Date	9	10	0	0	9	10	2	0	5	14	1	9	6	2	1	26
Early Manistee	9	10	0	0	5	12	0	0	2	0	3	5	5	0	2	21
Carman	9	7	0	0	8	1	0	0	3	0	0	0	5	18	0	24
Factor	7	13	0	0	8	5	0	0	7	2	1	0	6	4	1	17
Satisfaction	2	5	0	0	6	13	2	0	5	11	2	0	5	2	2	25
Manhattan	....				8	14	0	0	4	10	1	9	4	10	2	24
Coronation	....				....				....				....			
Surprise	....				8	12	0	0	....				....			
Brownell's Beauty ...	....				....				4	4	3	4	....			

Variety.	Wyong.				Paterson.				Miller's Forest.				Comboyne.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb	t.	c.	q.	lb.
Up-to-Date	5	18	3	10	1	13	0	6	2	6	0	11	5	9	2	9
Early Manistee	5	11	1	8	Failure.				2	10	0	11	4	12	0	1
Carman	5	12	0	4	2	3	0	0	2	5	0	10	3	5	1	17
Factor	5	11	1	8	....				1	17	1	2	....			
Satisfaction	5	6	0	24	....				2	8	0	10	3	12	3	26
Manhattan	4	13	3	11	....				2	16	3	16	4	11	1	15
Coronation	....				1	8	1	25	1	13	3	5	....			

All plots manured with 2 cwt. per acre of the mixture P7 except where marked*.

RESULTS of Potato Manurial Trials, Lower North Coast, 1918–19.

Manures and Mixtures.	Up-to-Date Variety.															
	Wauchope.				Mt. George.				Comboyne.				Wyong.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
No manure	7	3	2	0	8	14	0	0	2	1	1	11	3	15	3	10
3 cwt. Superphosphate	7	11	1	0	5	17	0	0	4	3	2	27	5	16	2	5
2½ cwt. P8 {1 part Superphosphate 1 ,, Blood and bone}	7	11	1	0	......				4	13	2	18	5	10	3	1
2 cwt. P7 {1 part Superphosphate 1 ,, Bonedust}	9	10	2	0	9	10	0	0	5	9	2	9	5	18	3	8
2 cwt. P8	......				9	18	0	0	......				......			

Manures and Mixtures.	Manhattan Variety.												Satisfaction.			
	Miller's Forest.				Mundrook.				Sherwood.				Paterson.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
No manure	2	14	0	0	4	7	0	1	3	7	2	0	1	7	0	6
3 cwt. Superphosphate	2	9	1	0	4	17	1	18	......				1	9	3	18
2½ cwt. P8 {1 part Superphosphate 1 ,, Blood and bone}	2	15	0	0	4	16	1	8	......				1	10	0	4
cwt. P7 {1 part Superphosphate 1 ,, Bonedust}	2	16	3	16	4	10	2	7	......				1	6	1	10
2 cwt. P8	......				......				......				......			
3 cwt. P7	......				......				3	17	1	0	......			
2 cwt. Superphosphate	......				......				3	12	0	25	......			
2½ cwt. P5 {16 cwt. Superphosphate 4 ,, Sulphate of Potash}	......				......				3	6	0	16	......			
3 cwt. P8	......				......				3	17	0	4	......			
Basic Superphosphate	2	11	0	0	......				......				......			

Summary.

If there be one operation more important than any other in the successful production of a crop of potatoes, it is the thorough preparation of the soil, coupled with early sowing.

The potato requires a deep, rich, loamy soil, containing large quantities of humus, and where the latter is deficient every endeavour should be made by sound cultivation methods, especially the growing of green-manuring crops such as field peas, tares, cowpeas, &c., to increase the quantity. Not only is humus the chief food supplier, but it is the main factor in holding the moisture. The practice of deep ploughing in the autumn, already adopted by many carrying out the experiments, and of fallowing through the winter months with occasional workings to check weed growth, has been proved to conserve moisture; and considering that for the last few years the early spring on the lower North Coast has been comparatively dry, success or failure largely depends upon good cultural methods. It was noticeable that where large quantities of moisture were available in the soil, or where useful rain had fallen during the early stages of growth, the result was a large number of tubers had formed, and where comparatively dry conditions prevailed in the early stages, followed by rain towards maturity, very few tubers formed, but they were of good size. The conclusion is that the supply of moisture stored by proper preparatory cultivation methods, when taken advantage of by sowing early, practically assures the maximum number of tubers forming, which then only require a further useful fall or two of rain to result in good yields being harvested. Not only was this statement fully borne out during the experiments, but it may be further stated that the moisture stored in more than one instance stood to the crop until after flowering time.

It is pleasing to note that frosts are not nearly so much feared as formerly, and the risk of having a few of the early growth "nipped" back is taken now in preference to waiting until warmer weather arrives—and rightly so, too. The resistance of the young plants is surprising, and by taking the extra precaution of sowing a good-sized set with an eye or two to spare, there is really nothing to be feared.

Another operation now universally carried out by those conducting experiments is the harrowing of the crop after the rows are noticeable. Not only does this stimulate growth, but all weed growth is checked, and any "cake" forming on the surface after rain is broken, thus allowing of the aeration of the soil. One has only to see a treated and an untreated plot side by side to notice the difference.

The value of manuring, even on the fertile and comparatively new areas of the Comboyne and Wyong, is more than justified, the difference in weight between the manured and unmanured plots there being more noticeable even than on the older lands of the Manning, Hastings and Hunter, although no doubt the greater deficiency in rainfall at the latter places was partly to blame. The difference between the treated and untreated plots leads one to believe that the potato, being a rather short-season plant, is capable of using more available soil ingredients than it could possibly gather in its immediate neighbourhood in the growing period; hence by supplementing the plant food in the soil with a suitable fertiliser (that is, one readily available for the plants use during its growth) increased yields will, in the majority of cases, be obtained. The outstanding feature over the whole plots has been the marked superiority of a dressing with 2 cwt. of the mixture P7 (which consists of equal parts of bone and superphosphate).

The dry atmospheric conditions were the main factor in preventing the spread of Irish blight, for, although it made its appearance here and there, the weather conditions were too hot and dry to favour its increase. Spraying with Bordeaux mixture was carried out on a few of the plots without proving useful. Judging by the results in other countries, this method of preventing the disease has proved very satisfactory; and it will have to be practised here if profitable crops are to be assured, for there is nothing surer than that this disease will make its appearance in damper seasons. Besides spraying, the use of clean seed and growing the crop on clean areas are factors in the prevention of attacks of the blight not to be overlooked.

In case frosts should occur late in the spring in our mild districts, citrus-growers would be wise not to allow their fruit to hang too long.—W. J. ALLEN.

The Packing of Fruit.

[Continued from page 522.]

W. J. ALLEN and W. LE GAY BRERETON.

Spring or bulge.—If fruit is brought just level with the top of the case when it is packed, it will be found to be below the top after even a short interval. This is caused by each fruit settling closer into its place, and by the fruit contracting more or less as it gives up some of its moisture; with wrapped fruit the folds of the paper become more closely compacted together and permit of settling. If no allowance is made for contraction in these ways the case will not look properly filled when opened up; moreover, the pack will be slack and the fruit liable to bruise by moving in its place during transit. To overcome this, the fruit should be packed above the level of the case, so that the top and bottom of the case will spring, or bulge, when nailed down. The packing of the fruit "high" allows for this contraction, and the spring of the top and bottom of the case closes up as the contraction takes place, keeping the pack keyed up tight. Under the old method it was possible, by turning so many tiers on end and so many flat, if necessary, to keep all packs to a uniform or standard height. Under systematised or standard space packing, the pack cannot be broken in this way, and consequently the height will vary from the maximum height permissible without the pressure being too severe upon the fruit through a series of decreasing heights till the ideal is reached, and then on till the spring is reduced to the minimum, or is sufficient only to allow for contraction during transit. When a change has to be made from flat to edge packing, or from one pack to another to allow for an extra tier, the first (*i.e.*, the lowest) count of this change will generally be of a maximum height, and will gradually decrease until the next change is made.

Though the spring, or bulge, is essential to the fruit arriving in satisfactory condition, it will be noticed that in some counts it is unavoidable to have it higher than is absolutely necessary, and for this reason certain conditions are demanded when standard space packing is adhered to. First, the timber of the top and bottom of the case must be cut fine enough to allow it to spring or bulge when nailed down without bruising the fruit; it is, in fact, the nearest approach to an adjustable case that has been obtained. Second, the fruit must be firm enough to stand the pressure of even the most flexible top and bottom.

Now, the minimum height that is necessary will vary according to the time that is likely to elapse between the packing and the opening up of the case by the buyer. If the probabilities are that the fruit will be bought and used within a few days after packing, as is often the case with fruit put on our local market, it need not have such a high spring as if it is to be sent a journey of weeks, or is to be stored for a long period. Even where space packing is adhered to, the heights can be adjusted to some extent. Let an example be taken to illustrate these several points. The 7–6 of the 2–2 pack in the Australian bushel case is generally the highest count of that pack that can be packed with the more commonly grown apples of flat type. The height is the minimum, but it is sufficient to ensure the fruit opening up satisfactorily after a few days' transition; at the same time it might not be satisfactory for a journey taking some weeks. Thus, for the former a packer would come down to the 7–6 before changing to the 5–4 of the 3–2 pack, but could avoid the 7–6 for the longer journey by changing from the 6–6 of the 2–2 to the 4–4 of the 3-2. It is admitted that the 4–4 of the 3–2 pack might give excessive height for very tender fruit, but it must be remembered that fruit in such condition is not fit for long transit. The tighter the fruit is packed the less allowance there need be for contraction. The higher counts of any pack leave smaller spaces; in other words, the fruit packs closer in the higher counts than in the lower counts of the same pack, hence there is likely to be less settlement in the former than in the latter, so that the gradual decrease of height as the counts rise fortunately occurs in the right direction.

Though the flexibility of the top and bottom of the case will allow for the fruit packed high towards the centre of the case, there can be but little give where the timber of the top and bottom is nailed to the ends. Thus the end fruits of the pack should come but very little over the top edge of the case. When pressed with the hand they should go down to about level, but spring again into their place when released. The height should increase from each end towards the centre, and it will be found that this naturally occurs, the reason being that the spaces between the end fruit in each tier have fruits partly jutting into them only on one side, whereas the remainder has fruit partly taking up the space on both sides.

In the lower counts of each pack, which are liable to run high, the heights towards the end can be further reduced by placing the smaller fruit of the range that is being packed at the ends, or if, through negligence, the packer has completed the case except for the top tier before noticing the ends, and if he is edge-packing flat-type fruit, he can turn the end fruits flat; but as the flat-type fruit takes more room placed flat the smaller fruit of the range must be used, not only for the ends but also for the next few of the tier, or it will be found that the fruit is overrunning the spaces of the tier below.

The higher counts of each pack being liable to run low, it will sometimes be necessary to keep up the ends by placing larger fruit of the range at the ends. If the packer has gone a little too far without noticing the effect of his work, the error can be corrected by using a few fruit at the ends slightly over the range. There is no deception in this, because no buyer will object to a few fruits slightly over size, provided the count is not reduced by it. However, it should be avoided in the top tier, as it detracts from the appearance of the pack in the event of the case being opened there. Packers will unblushingly declare that they never use such means, but the calipers tell a different tale. Nor is there any objection to the turning or use of fruit slightly over range, as mentioned, when packing for market; but, of course, the practice should be avoided for show work.

The curve of the spring or bulge should be even, and one fruit should not be projecting above the line of the curve more than another, otherwise it will receive undue pressure from the top when nailed down. This is likely to cause bruising, both to the high fruit and to the fruit forming the space below it.

Owing apparently to the relatively greater depth to the width, and consequently the greater number of tiers, the maximum height of the spring or bulge is rarely as great in the Australian bushel case as the maximum of the Canadian case; in the former it is about $1\frac{1}{4}$ inches, and in the latter about $1\frac{1}{2}$ inches. To the novice this often appears excessive, but it should be remembered that half of the maximum is absorbed by the top and half by the bottom, which means $\frac{5}{8}$ inch spring top and bottom in the first instance, and $\frac{3}{4}$ inch spring in the second instance. It is important that both top and bottom should be of about equal flexibility, for obviously the pressure on the fruit is less when the spring is divided by half.

A space pack, too, is far more elastic and will stand more pressure than a solid pack, *i.e.*, one in which the fruit of one tier is placed directly over the fruit of the tier below.

The Canadian Case.—The formation of the 2–2 and 3–2 packs has already been described under the Australian bushel case, and there is no need to repeat it here; but in the Canadian case the 2–2 is brought up in four tiers (an even number), and the 3–2 in five tiers (an odd number), and if this is borne in mind the remarks under last month's heading, "the analysis of packs," will apply.

The 3–3 pack contains an even number of longitudinal rows (six), and is brought up in six tiers (an even number), so that the analysis of the 2–2 can be applied to the 3–3. The 3–3 is formed as follows:—Place No. 1 in the left-hand corner of the end nearest the packer, Nos. 2 and 3 to the right of No. 1, leaving spaces between Nos. 1 and 2 and between Nos. 2 and 3, and also between No. 3 and the right-hand side of the case. Nos. 1, 2 and 3 form the first cross row of the case. Place No. 4 in the space between Nos. 1 and 2, No. 5 in the space between Nos. 2 and 3, and No. 6 in the space between No. 3 and the right-hand side of the case. Shift Nos. 2 and 3 to the right or left as necessary, so that Nos. 4, 5 and 6, which form the second cross row, come at right angles to the sides of case. It will be noticed, as in the 2–2 pack, that the space between No. 3 and the right-hand side of the case will be rather greater than the spaces between Nos. 1 and 2 and between Nos. 2 and 3. As soon as one gets used to the pack it will seldom be necessary to readjust Nos. 2 and 3. Continue placing as described till the tier is complete, and make the necessary adjustment as described for the other packs, if the last three fruits do not fit in snug.

To pack on the flat, which is the method chiefly used in the Canadian case, place the fruits stalk down throughout, or turn the last tier calyx down as previously described, to reduce the height slightly.

For open-edge packing, place as described for the 3–3, but with the fruit on edge; the stalk end should be towards the end of the case nearest the packer and the calyx towards the opposite end.

For edge-closed packing, if a flat-type fruit is being packed, place Nos. 1, 2 and 3 as for the edge open, place No. 4 with the stalk to No. 1, No. 5 with the stalk to No. 2, and No. 6 with the stalk to No. 3; as a general rule the calyx of Nos. 4, 5 and 6 should be diagonally towards the right side of the case. Nos. 7, 8 and 9 should have the stalk end against Nos. 4, 5 and 6 respectively, with the calyx generally diagonally towards the left side of the case. It may be necessary to vary this turning in order to keep the spacing even. With fruits that are higher than they are wide, *i.e.*, with the longitudinal diameter greater than the transverse diameter, the turning will generally be reversed. In all cases, whether placed flat, edge open, or edge closed, the fruit of each succeeding tier is placed over the spaces of the tier below.

The standard pack given for the Australian bushel case has been very thoroughly tested for apple packing, and it has never been found necessary to depart from true space packing, although with unusual shapes it may be necessary to add counts at one end and not use counts at the other end of the chart for the various packs. But with the Canadian case difficulties have occurred at some of the changes. It is hard to say for certain why this is, but the reason that suggests itself is that there are fewer tiers, and consequently the increase in size of the spaces between the fruit of greater sizes has not as many opportunities to overcome the increase in height of the pack, and *vice versâ*.

In cases cut with suitable tops and bottoms, these difficulties are usually surmountable, though the spring is liable to run rather too high in some counts and be on the low side in others.

With many of the cases met with, especially the hinged-lid type and those cut from hardwoods, the tops and bottoms are too heavy for the counts that run rather too high, and these counts have to be avoided. Some of these difficulties may be pointed out here with advantage. With the 2–2 pack the lower counts are packed on the flat, and are satisfactory till the change to the edge becomes necessary. Then, though the first count is packed open, it is liable to run too high. Flat-type apples will pack on the flat and give sufficient height generally down to the 5–5 count. The 6–5 count will often run low on the flat and high on the edge. If kept open it is just possible to secure a satisfactory pack with a flexible top and bottom, though the spring is excessive and the buyer is getting too full a measure. With cases with heavy tops and bottoms it is altogether impossible. This difficulty can be side-stepped by avoiding these counts; the largest of the range of size which should go into this count, *i.e.*, 6–5, will then be absorbed by the 5–5 and the smaller by the 6–6. The range in these counts will then, of course, be ¼ inch instead of ⅛ inch. As a matter of fact, the size that runs too low packed 2–2 by 6–5 on the flat in some varieties will pack 3–2 on edge and come to a nice height in four tiers. There are objections, however, to a four-tier 3–2 when counts are being marked on the cases according to the chart, as the count would only be less than that shown on the chart for the true 3–2 by five tiers. Mistakes are therefore likely to occur, especially in big packing houses where several packers are employed. Of course, there would be clues by which the four-tier 3–2 could be detected (see "analysis of packs"), but for safety the count would have to be marked by the packer as soon as completed. Moreover, it is probable that the true five-tier 5–5 would come up on the flat, and it could be distinguished in this way. However, it is a departure from the system, and therefore there is a chance for an error to creep in. The remainder of the 2–2 count will generally come out satisfactorily on edge. Of course, the count on which this change and difficulty occurs may vary with different-shaped apples. The same difficulty is met with on the change from flat to edge on the 3–2, though the count on which it occurs may vary according to the shape of the apple; often the 6–5 of the 3–2 pack will run too low on the flat and too high on the edge, even though placed open. It can be avoided by packing the largest of the range in the next count lower, and the smaller of the range in the next count higher, as mentioned for the 2–2. Possibly, though it has not been tested, the same fruit would pack a five-tier 3–3 on edge, but this would have the same objection as was pointed out above for a four-tier 3–2. A trial was made at the orchard at Glen Innes Experiment Farm with a Canadian case made up with 11⅛ inches depth and 10 inches width for those counts that ran too low on flat and too high on edge, but it was found not only to entail more trouble when estimating the number of cases required for a crop, but to have more serious drawbacks when stacking the packed cases.

The following chart gives the three packs and their various counts for the Canadian case:—

Pack 2–2 × 4 tiers. Approximate Ranges, 3 inches to 3⅞ inches.	Pack 3–2 × 5 tiers. Approximate Ranges, 2⅜ inches to 3 inches.	Pack 3–3 × 6 tiers. Approximate Ranges, 2¼ inches to 2½ inches.
3–3 = 48	4–4 = 113	6–5 = 198
4–3 = 56	5–5 = 125	6–6 = 216
4–4 = 64	6–5 = 138	7–6 = 234
5–4 = 72	6–6 = 150	
5–5 = 80	7–6 = 172	
6–5 = 88	7–7 = 175	
6–6 = 96	8–7 = 187	
7–6 = 104	8–8 = 200	

(*To be continued.*)

The Testing of Pure-bred Cows in New South Wales.*

L. T. MacINNES, Dairy Expert.

As approved at last annual meeting of the Association, this annual review has been made to cover a twelve months' period ending 28th February, 1919, the date that marks the close of each year's official testing period.

Records of commercial butter for all cows completing their tests prior to the close of this year have been calculated, as has hitherto been customary, on the basis of the O'Callaghan chart. The butter-fat yields, however, have been calculated separately on the actual weight of milk and butter-fat test percentage (Babcock) for each morning's and evening's milkings, as officially recorded. In future, this additional clerical work will be obviated by the adoption of butter-fat alone as the basis of calculation, and estimating the commercial butter yield from that of the total butter-fat on a basis of 83 lb. fat in 100 lb. commercial butter, as decided by the Society's Council towards the end of the year. The additional records made available during the period now under review, have again emphasised the value of heredity in milk and butter-fat production. Pure-bred sires and dams have received increased approval on account of their prepotent qualifications, but it is becoming more and more recognised by breeders and dairymen that something more is required than the capacity to reproduce type and constitution. The value of a pure-bred pedigree is unquestionable, but for dairying purposes it cannot be too often pointed out that production should form a most important part of every genealogical table.

Average Yields.

The average butter-fat percentage has been worked out on the average yields, as set out under the different standards for ages adopted by the Association, and is as follows:—

Age Standard.	Fat per cent.
4 years and over	4·18
3 years and under 4	4·37
Under 3 years	4·48

Last year the averages were 4·5 per cent. for 4 years and over; 4·3 per cent. for 3 and under 4 years; and 4·45 per cent. for 2-year-olds, which was very little different to the last test results, except in the aged class, where the fat percentage was ·3 per cent. higher last year. In 1915–16 the average of all cows tested was 4·9 per cent.; 1916–17, 4·4 per cent.; 1917–18, 4·5 per cent.; 1918–19, 4·3 per cent. butter-fat. It will be seen that the average fat content of the milk of those cows tested under this scheme is not only very much above the legal standard (3·2 per cent.), but also well over 4 per cent. This is an important factor in guiding dairymen requiring stud bulls—one that must have a material influence on the raising of the average yields of the State dairy herds.

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* Extracted from the official report for presentation to the annual meeting of the United Pure Bred Dairy Cattle Breeders' Association of N.S.W., covering the year ended 28th February, 1919.

NUMBER of Cows completing periods of 273 days during the year ended—

Breed.	30 June, 1914.	30 June, 1915.	30 June, 1916.	30 June, 1917.	28 Feb., 1918.*	28 Feb., 1919.	Last Year's Increase.
							Per cent.
Milking Shorthorn ...	68	22	11	46	44	48	9
Illawarra	...	...	...	...	...	6	...
Jersey	258	199	94	28	19	28	47
Guernsey	10	18	1	8	7	9	3
Ayrshire	...	...	20	14	14	20	43
Friesian	...	...	...	...	...	13	...
Totals	336	239	126	96	84	124	47·6

* Portion of this year is included in, or overlaps, the preceding column for 30th June, 1917.

NUMBER of Cows under test at the end of the year.

Breed.	Year ending 30 June, 1916.	Year ending. 30 June, 1917.	Year ending 28 February, 1918.	Year ending 28 February, 1919.
Milking Shorthorn	26	65	29	142
Illawarra	...	...	2	96
Jersey	27	37	13	63
Guernsey	7	15	4	22
Ayrshire	12	19	15	27
Friesian	...	...	3	23
Totals	72	136	66	373

Last year attention was drawn to the decrease in the number of cows completing their tests as compared with the year 1914. It is pleasing to have to record that the figures for the year ending 28th February, 1919, show a large increase in the number being tested, and, not only that, but two additional breeds—Illawarra and Friesian—are recorded for the first time. In addition to the 124 pure-breds, 16 grades were tested, making a total of 140 cows for private owners. The figures would have been much better still if it had not been for the disastrous drought experienced during the past year. This and the influenza epidemic were the cause of seventy-seven cows being withdrawn before their records could be completed. The tests of another twenty-one were not completed for ordinary reasons which occur each year. The drought also deterred many breeders from carrying out their expressed intentions of entering their cows under the testing scheme.

Increasing Support from Breeders.

During the year, as a result of the efforts of the Department and your Council, the benefits of the testing scheme were brought directly under the notice of breeders, and as a result many responded by entering their studs

The following table shows the extent of this increased support:—

HERDS Tested during twelve months ended 28th February.

	1918.	1919.
Milking Shorthorn	4	13
Illawarra	2	10
Jersey	4	10
Guernsey	1	5
Ayrshire	1	3
Friesian	1	2
	13	43

This more than three-fold increase gives a better idea of the expansion of the movement than do the foregoing tables of the actual number of cows under test.

In order to carry out the work of testing, the Department has had to utilise the services of an increased number of its staff. In 1917–18 two officers sufficed, one being wholly and the other partially engaged on this work. Last year two officers were wholly and six were partially so employed. This increase was necessary, not only because of the greater number of herds and cows, but because the area in which the studs were located was extended. In 1917–18 testing operations were carried out in the following seven districts:—Sydney environs (including Minto, Ingleburn and Rooty Hill), Berrima, Tumut, Gundagai, Illawarra, Upper Hunter River and Bangalow. Last year Tumut was dropped, while the following additional districts were embraced in the widening scope of the scheme:—Manning River, Bellinger River, Leeton, Wagga, Richmond River, Tweed River, Lower Hunter River, Bundanoon and Inverell.

Privately-owned Stock.

From the table below it will be seen that, as was the case last year, the averages for each breed exceeds considerably the standard laid down in Rule 16; also that in not one single instance did a heifer of any breed give a production yield below the standard set. The lowest yield in butter-fat for a 2-year-old was 166 lb. fat, which is the standard for this age. This was given by a Milking Shorthorn heifer. In all other breeds the lowest yield was very much higher than the standard, the nearest being an Ayrshire heifer with 48·23 lb. above standard. The Milking Shorthorn representative, Melba XV (daughter of Melba VII by Kitchener), owned by the Scottish Australian Investment Company, Darbalara, put up the best record for the year in this class. Last year the highest yields in 273 days for heifers under 3 years were the Milking Shorthorn, Melba IX, with 471·72 lb. butter (O'Callaghan chart); the Jersey, Brighton Coomassie II, with 429·51 lb. commercial butter (O'Callaghan chart); and the Ayrshire, Jean of Kabibinokka, with 409·23 lb. commercial butter (O'Callaghan chart). The Jersey, Exile's Brighton Queen, still holds the New South Wales record (and I think the

Australian, too) for this class, with 10,845 lb. milk, yielding 594 lb. commercial butter (O'Callaghan chart). This record was established under an official test commencing 26th August, 1915, and lasting 273 days. Last year's average of 2-year-olds of all breeds was 6,466·8 lb. milk, 337·3 lb. commercial butter (O'Callaghan chart), being somewhat better than the average put up this year.

AVERAGE of Yields of Stock under 3 years old.
Official Standard, 166 lb. Butter-fat.

Breed.	No. Tested.	Average Yields.			On or above Standard.			Lowest Butter-fat.	Highest Butter-fat.
		Milk.	Butter-fat.	Commercial Butter.	No. of Cows.	Average Fat.	Average Fat percentage.		
		lb.	lb.	lb.		lb.		lb.	lb.
Milking Shorthorn ..	10	6,192·72	262·30	305·91	9	94 30	36·2	166·	395·07
Illawarra	1	9,640·50	380·25	444·99	1	214·25	56·3	380·250	380·25
Jersey	6	5,926·50	299·48	350·26	6	133·48	44·6	222·636	362·61
Guernsey	2	5,925·50	284·05	332 35	2	118·05	41·5	264·850	303·25
Ayrshire	2	5,561·60	215·65	251·35	2	49·65	23·0	214·230	217·08
Holstein-Friesian ..	Nil.	..		..	..	..	..	..	..
All Breeds ..	21	6,194·70	275·96	322·01	20	109·96	39·86	166·	..

In the class for cows 3 years old and under 4, five cows, or 17·8 per cent., failed to attain the standard of 207 lb. butter-fat. Last year the average yield was 7,029·8 lb. milk, 354·4 lb. commercial butter (O'Callaghan chart), and it will be seen at once that this year's figures are considerably lower. The highest production last year in 273 days for this class was put up by the Milking Shorthorn cow Melba VIII, with 516·18 lb. commercial butter (O'Callaghan chart), which is very much better than the record this year, although it has been exceeded in previous years, notably by the Jerseys, Exile's Brighton Queen, with 752 lb. commercial butter, Maitland Queen of St. Lambert, 582·9 lb. commercial butter, and Brighton Vanilla II, with 629 lb. The latter's great rival, Melba VII, unfortunately for this comparison, was not tested as a 3-year-old. Her records are 412 lb. butter at 2 years, and 678 lb. at 4 years.

AVERAGE of Yields of Stock 3 years old and under 4.
Official Standard, 207 lb. Butter-fat.

Breed.	No. Tested.	Average Yields.			On or above Standard.			Lowest Butter-fat.	Highest Butter-fat.
		Milk.	Butter-fat.	Commercial Butter.	No. of Cows.	Average Fat.	Average Fat percentage.		
		lb.	lb	lb.		lb.		lb.	lb.
Milking Shorthorn ..	8	5,904·66	241·81	281·32	6	42·81	20·4	152·562	410·436
Illawarra	1	7,516·00	311·715	361·92	1	104·715	50·2	311·715	311·715
Jersey	8	5,562·90	279·94	327·50	7	72·94	34·9	197·272	424·02
Guernsey	2	4,528·50	221·25	257·47	2	14·25	6·6	218·793	223·71
Ayrshire	7	6,525·40	278·22	324·03	7	71·22	34·0	224·69	373·01
Holstein-Friesian ..	1	5,496·00	198·73	229·62	..	..	..	198·73	198·73
All Breeds ..	27	5,907·40	260·26	303·13	23	54·26	26·2	152·562	424·02

In the class for the mature animals, sixty-four out of seventy-six (about 84 per cent.) reached or exceeded the official standard of 249 lb. butter-fat. The average yield is again below that of the previous year, which was 8,228 lb. milk, 433·6 lb. commercial butter (O'Callaghan chart). The highest fat yield is much below the records established by the Milking Shorthorn, Melba VII, with 836 lb. commercial butter, and the Jersey, Brighton Vanilla II, with 808·8 lb. for a similar period. The highest milk yield was recorded by the Milking Shorthorn cow Lovely II, with 14,283 lb., averaging 4·2 per cent. butter-fat. This was exceeded last year by the Milking Shorthorn cow Empress of Burradale, with 15,073½ lb. (average test, 4·1 per cent.); the Jersey, Brighton Vanilla II, with 14,867 lb. (average test, 4·6 per cent.); and the Milking Shorthorn, Melba VII, with 14,371 lb. (average test, 4·9 per cent.). It is noted elsewhere, however, that on the extended test of 365 days Lovely II put up a record, beating all others.

AVERAGE of Yields of Stock 4 years old and over.

Official Standard, 249 lb. butter-fat in 273 days.

Breed.	No. Tested.	Average Yields.			On or above Standard.			Lowest Butter-fat.	Highest Butter-fat.
		Milk.	Butter-fat.	Commercial Butter.	No. of Cows.	Average Fat.	Average Fat percentage.		
		lb.	lb.	lb.		lb.		lb.	lb.
Milking Shorthorn ..	30	7,919·66	320·64	374·85	22	71·64	28·8	197·55	592·6
Illawarra	4	7,710·70	319·95	373 24	4	70·95	28·5	249·30	472·41
Jersey	14	6,023·00	311·225	364·64	11	70·95	28·5	204·135	417·8
Guernsey	5	8,186·30	382·608	447·68	5	133·608	53·6	250·02	589·51
Ayrshire	11	7,795·55	325·930	380·38	10	76·93	30·9	228·314	483·21
Friesian	12	9,252·00	318·460	378·05	12	69·46	27·9	277·482	408·08
All Breeds ..	76	7,729·20	323·420	378·28	64	74·42	30·0	197·55	592·6

Privately-owned Cows Completing 365 Days Test.

During the year thirteen Milking Shorthorns and one Illawarra extended their tests beyond the 273-days period to cover 365 days, as per Rule 5B.

The Milking Shorthorn, Lovely II, owned by Mr. W. H. Dudgeon, of "Glenthorne," Bangalow, Richmond River district, yielded 18,418 lb. milk, 767·43 lb. butter-fat (average fat test, 4·2 per cent.). While the fat yield is a meritorious one, it has been exceeded in previous years by the Milking Shorthorn cows Melba VII and Empress of Burradale, and the Jersey, Brighton Vanilla II. Lovely II, however, has gained the distinction of having produced the greatest amount of milk of any cow recorded in Australia to date, beating the record of Brighton Vanilla II, who put up, in the preceding twelve months, the then highest yield of 18,197 lb.

Summary of Privately-owned Cows Tested.

Cows tested for 273 days.

Breed.	Test completed.	Number being tested on 28th February, 1919.	Number withdrawn owing to influenza epidemic and drought.	Tests not completed for various reasons.
Milking Shorthorn	48	142	18	6
Jersey	28	63	35	6
Ayrshire	20	27	...	...
Guernsey	9	22	...	...
Illawarra	6	96	24	8
Holstein	13	23	...	1
	124	373	77	21

Cows tested for 365 days.

Milking Shorthorn	13
Illawarra	1
	14

Government Cattle.

This year the yields from Government stud stock completing the testing period are published. The total number of cows tested is less than in previous years. The names of these cows as they commence testing are given to the Dairy Branch by the Herdmaster, and are entered in the Association's official records under the same conditions as govern privately-owned stock.

The following tables give the number of cows completing the official tests, and also show the number at each farm under test at 28th February, 1919. It will be seen that forty-six reached the official standard, and that eighty were undergoing the test at the end of the official year. This number will be greatly augmented during the current period (1919–20).

Average Yields of Government Stock under 3 years old.

Official Standard, 166 lb. Butter-fat.

Breed.	No. Tested.	Milk.	Butter-fat.	Commercial Butter.	On or above Standard.			Lowest Butter-fat.	Highest Butter-fat.
					No. of Cows.	Average lb. Fat.	Average Fat percentage.		
		lb.	lb.			lb.		lb.	lb.
Milking Shorthorn ..	1	5,310	217·	..	1	51·	30	217	217
Jersey	8	4,303	219·5	..	8	53·5	32	183	247
Ayrshire	7	5,713	224·7	..	7	58·7	35	206	245
Red Polls	..	..	..	..	..	..	..	..	..
All Breeds ..	16	4,983	221·6	..	16	55·	33	183	247

AVERAGE Yields of Government Stock over 3 years old and under 4.
Official Standard, 207 lb. Butter-fat.

Breed.	No. Tested.	Milk.	Butter-fat.	Commercial Butter.	On or above Standard.			Lowest Butter-fat.	Highest Butter-fat.
					No. of Cows.	Average lb. Fat.	Average Fat percentage.		
		lb.	lb.			lb.		lb.	lb.
Milking Shorthorn ..	..	..	..	..	..	..	..	..	..
Jersey	6	5.318	282·7	..	6	75·7	36	262·5	312
Ayrshire	3	7,211	296·	..	3	89·	43	276·	316
	9	5,949	287·	..	9	80·	38	262·5	316

AVERAGE Yields of Government Stock 4 years old and over.
Official Standard, 249 lb. Butter-fat.

Breed.	No. Tested.	Milk.	Butter-fat.	Commercial Butter.	On or above Standard.			Lowest Butter-fat.	Highest Butter-fat.
					No. of Cows.	Average lb. Fat.	Average Fat percentage.		
		lb.	lb.			lb.		lb.	lb.
Milking Shorthorn	2	7,211·	298·5	..	2	49·5	20	291	306
Jersey	13	6,724·	352·6	..	13	103·6	41	276	484
Ayrshire	4	7,636·5	295·2	..	4	46·2	18	268	351
Red Polls	2	7,791·5	328·	..	2	79·	31	278	377
All Breeds ..	21	7,045·	334·	..	21	85·	34	268	484

The Calculation of the Records.

Some alterations in the method of calculating the records have been made recently, taking effect from 1st March, 1919, and the following extracts from the instructions issued to testers are published in view of the interest taken in the matter some time ago :—

All results are to be recorded in lb. of butter-fat. Its equivalent in commercial butter is officially estimated at the end of the testing period (273 or 365 days) on the basis of 83 lb. butter-fat to 100 lb. commercial butter (Rule 5). If the owner desires to have the yields computed, in terms of commercial butter, on the day the test is taken, it is done by the tester by means of the O'Callaghan chart as a temporary expedient.

The calculations for the sub-periods (monthly) and full period (273 or 365 days) are made in Sydney and sent to the breeders a few days after the test has been carried out. The reason for this is that the method of calculating each test depends on the time that has elapsed between the date of calving and the date of the first test.

For cows commencing to test subsequent to 28th February, 1919, calculations are made by one of the three following methods :—

(*a*) *In the cases of cows tested within fourteen days inclusive after calving*, the period of 273 days is covered by ten tests, and, in the cases of cows completing a 365 days' test with a view to obtaining the Department's £100 prize for butter-fat yield, by thirteen tests ; in these latter cases the last test is made not more than ten days before the end of the period. In order to calculate the yield for the first period (thirty-three days) the milk weights and butter-fat tests of the first two tests are averaged ; for the second period the results of the second and third tests are averaged ; and so on until the last period, when the average is calculated of the twelfth and thirteenth tests or the ninth and tenth tests as the cases may be.

(*b*) *In the cases of cows tested fifteen to twenty-four days, both inclusive, after calving*, the original method of the United Pure Bred Dairy Cattle Breeders' testing scheme holds good. The whole period is covered by nine or twelve tests only, as required to complete 273 or 365 days respectively, and the tester's records are accepted without averaging with proximate tests, unless they are abnormal.

(*c*) *In the cases of cows tested twenty-five or more days after calving*, the calculations made on the first test and weights of milk count backwards to cover a period of thirty-three days, or in the event of the test being made under the thirty-seven days after calving, to within four clear days after calving, in which case the balance of this first period is calculated forward from the date of test until the thirty-three days are completed. Each succeeding calculation is computed on an average with the preceding test, that is, the second calculation is made on the average results of the first and second tests, the third calculation on the second and third tests, and the last calculation on the average results of the eleventh and twelfth tests. The whole period is covered by nine or twelve tests as the case may be.

Some Comments on the Report.

Mr. J. T. Cole, President of the United Pure Bred Dairy Cattle Breeders' Association, makes some comments on the year's testing from which the following paragraphs are extracted :—

The marked increase in the number of breeders taking part in the official testing for the year is very heartening, and the advantage from a breeder's point of view of this large addition to the ranks of the officially-tested cows of the State is a very solid one. The success of any breed of dairy cattle depends, to a great extent, upon the number available of stud cows of good type and quality, with outstanding production. It is from these cows that bulls can be bred to further improve the pure-bred herds, and to improve the general standard of production in the dairy herds of the State. There is only one way to determine the producing capacity of a cow, and that is by carefully testing her. Breed and quality may be decided by looking at her, but no man can definitely state from inspection whether a cow's milk will test 3, 4, 5 or 6 per cent. The variation in percentage of butter-fat will make all the difference to the owner as to whether the cow will "eat her head off" or pay handsomely, and it also determines whether she is worthless or invaluable as a breeder. Therefore, from the breeder's outlook, the more high-producing cows of good type that are discovered by the test, the easier becomes the problem of maintaining the producing standard of the breed, and of improving it.

There should be no gambling element in the breeding of high-class dairy stock. The breeder of beef cattle can always check his results by the butcher's block. The breeder of sheep has the wool clip to guide him, as well as the butcher's block. The breeder of the mighty thoroughbred goes to no end of trouble to prove his stock upon the racecourse. How much more important is it that the breeder of dairy cattle should know, beyond the shadow of doubt, what is the producing capacity of his stud cows!

Given the right material to work upon, the breeder can only fail if his methods of mating are wrong, or if the cattle are insufficiently fed, or unskilfully milked and attended to. To produce large quantities of milk and butter the cow must first of all be strong and healthy. She must have plenty of nourishing food, and she must be carefully milked at least twice daily, as near as practicable on even time.

I wish, on behalf of the United Pure Bred Dairy Cattle Breeders' Association, to thank the Department of Agriculture for the good work they have done in carrying out the testing for the past year. The influenza epidemic and strikes have upset many things, and must have greatly increased the difficulties of coping with the work over the great area to which it has extended.

The Creation of a Vineyard.

H. E. LAFFER, Viticultural Expert.

In establishing a vineyard the grower should remember that the life of a vine and its period of commercial productivity extend over a very great number of years. Instances are by no means uncommon in Australia where vineyards planted from seventy to ninety years ago are still productive, and the average life of a vine may be taken as from thirty-five to forty years.

To a large extent the length of time a vine will continue profitable must depend upon the depth and fertility of the soil in which it is situated, for the reason that the greater the scope allowed for the root system the more vigorous will the growth be. Ample supplies of plant food encourage general vigour, and thereby enable the plant to more effectively withstand the ravages of time. Considering the long life of the average vineyard, and the many years over which the initial cost of preparing the soil and planting the vines will be distributed, the grower should not hesitate to do the work thoroughly.

In common with other plants, even those of only annual growth, the future development and success of a vine depends very largely upon its start in life. In other words, the greater the care expended upon the establishment of the young vines the better will they develop, and the heavier crops will they produce in later years.

Preparation of the Land.

The young vine when planted in its place may consist of an unrooted cutting or of a plant that has for a time been in a nursery bed, where it was able to develop a limited root system. In either case, the general and permanent root system has yet to be developed. As the roots spread from the stem in search of food they will, as a matter of course, take the line of least resistance. Hence, if the soil is fairly open, sandy, alluvial or gravelly in its nature there is no hindrance to a general development in all directions. If, on the other hand, the soil is shallow, heavy, or underlaid by a hard pan or bed of clay, rock, &c., the root system simply extends itself in the top soil, remaining close to the surface. In such a position the roots are more susceptible to drought and suffer more quickly from extreme heat, and the whole system of the plant lacks vigour throughout its comparatively short existence.

Few of our cultivated plants will endure greater variation in soil and climatic conditions than the grape vine, but this extreme hardiness does not indicate that the vine will be profitable in all soils. In many cases, however, efficient preparation before planting will overcome the deficiencies.

The aim in getting the soil ready for planting should be to break it to such a depth that the young roots will push down more or less vertically, reaching into the deeper layers of soil in their search for nourishment. In cases where phylloxera-resistant vines are being planted it is imperative that the land should be subsoiled, for the reason that these vines show less tendency to send their roots down than do the ordinary European varieties.

There are two ways in which this preparation can be carried out. On small areas it is sometimes done by hand-trenching, but generally speaking this is far too costly. Apart from the labour connected with the operation, however, it is doubtful if the result is relatively superior to that obtained with a good subsoil plough and a team of horses or bullocks. Indeed, unskilful trenching may do a great deal of harm by bringing the clay subsoil to the surface. In the case of subsoiling, the lower layers are turned up without bringing the raw subsoil to the surface.

The depth of the preparation is important, and, speaking generally, we may take it that a minimum of 15 inches should be the rule; better still, if it is possible to get down to 18 or 20 inches. Naturally, the heavier a soil the greater the care that should be put into its preparation.

The best time to subsoil is during the autumn. At that time of year there is less moisture in the subsoil, and consequently it breaks up more freely than would be the case if it were in a plastic condition. As a rule it is considered preferable to do the subsoiling some considerable time before it is intended to plant the vines, and in many cases the practice is to allow the land to rest for a year after the soil has been broken. It must be remembered that land freshly subsoiled is in a very open condition and full of air pockets, and if vines are planted under these conditions in the natural settling of the soil the roots may, more or less, lose contact with the earth, and most likely the plants will not strike. It is very important that the soil should be well packed around the roots if the vines are to obtain a good and vigorous start.

It has to be admitted that the loose condition obtained by subsoiling does not last indefinitely, for no matter how well land is broken up it naturally tends to become consolidated once more with the passage of time. However, this is of no great consequence if the vines have been well planted, for in the meantime the root system will have been established deep down in the subsoil.

If it is intended to plant the vines shortly after subsoiling is completed, the land must be thoroughly worked down with harrows, scarifiers and rollers in order to pack it and secure a fairly even tilth on the surface.

Distance of Planting.

The spacing of the vines is controlled by several factors, the most important of which is the fertility of the soil. Fertility is influenced by the available amount of moisture, for without water as the vehicle to carry the plant food into the vine, no growth can be obtained. At the same time, unless there is sufficient heat to assist the transpiration of moisture from the leaves there cannot be strong growth. It is for this reason that irrigated land in hot dry districts is so productive of strong growth. It was long considered that the more fertile the soil the closer together the vines can be placed, but it is quite a fallacy, because it takes into consideration but one factor, viz., the amount of plant food available to promote growth.

The important point to be considered is the amount of vegetation developed by the vine in any one season, and as the more fertile the soil under normal climatic conditions the greater the growth, the vines need to be spaced wider apart in rich soil, or the foliage becomes too dense and the vines hamper one another. In poorer soil the spacing may be closer, to make up for the smaller area occupied by the individual plants.

In many of the older vineyards the plan adopted was to plant vines as close together as 3 feet square, but it was soon found that this was too close, as a greater amount of hand labour was needed in cultivation, and therefore the cost of all operations was correspondingly greater. The tendency more recently has been to plant the vines wider apart in order that as much horse-power as possible might be used. Consequently there is a good deal of variation in the spacing according to the local conditions and the variety of the vines. Thus, we find Zante currants in rich land and under irrigation spaced at very wide intervals in order to allow for the enormous amount of growth made. Wine varieties, on the other hand, are planted closer owing to the poorer soil conditions and the smaller growth made. Amongst growers of table grapes in certain districts the practice adopted is to plant 5 feet x 5 feet or 6 feet x 6 feet apart, and to raise a bush-pruned vine limited to four or six spurs. Under other conditions, the vines are planted at greater distances, and larger individuals are built up. The cost of working is thus reduced, and the larger vines have a greater fruiting capacity, which compensates for the smaller number per acre. According to the fertility of the soil, we may say that it is capable of carrying a given number of vines per acre. That is to say, for each vine a given area of soil is needed for root development, and it matters little how the vines are spaced so long as each has about that area. For instance, vines may be planted 6 feet x 6 feet, which equals 36 feet square per vine, whereas 8 ft. x 4 ft. 6 in. would give the same area, and enable cultivation to be carried out more economically.

There are two factors operating in Australian vineyards which are likely to influence the wider planting of vines. The first is the necessity of manuring, and the second the possibility of diseases, such as downy mildew, which render frequent spraying an essential operation.

In the first case, the rows need to be wide enough apart to allow of the passage of a small seed and manure drill for the purpose of sowing artificial manures, and possibly seed for some form of green manure crop. When the rows are so close together as to prevent the use of a drill and to render the ploughing under of the crop difficult, green manuring becomes practically an impossibility.

Since downy mildew established itself in our vineyards, systematic spraying has become necessary if the disease is to be held in check. In certain seasons, of course, climatic factors will control the development, but there will always remain the possibility of quick action being necessary. Except on small areas, where spraying can be done with the knapsack, some rapid means of treating the whole vineyard is needed, and this is best accomplished by one of the spray tractors. Sufficient space is needed for working the tractor, while on the other hand the discharge of the spray is continuous, and the closer the vines are together in the rows the less waste there will be.

Another point for consideration is, that in the case of trellised vines, the wider spacing of the rows materially decreases the cost of the trellising. Naturally, a good deal depends upon the variety and upon factors contributing to vigour of growth, but the main thing to consider is how to plant the desirable number of vines to the acre without unduly crowding them in the rows.

The habit of the vine also in a measure determines the distance apart. For instance, varieties of a spreading or trailing habit of growth, such as Shiraz, Malbeck, Carbernet, &c., will need more room than those of upright growth like Mataro, Grenache, Carignans, Uguni, Blanc (White Shiraz), Doradillo, &c. With these latter types, the question of trellising need not always be considered, for the reason that they can be formed as bush vines and spur-pruned. Even so, although they are generally planted upon the square system, the same factors will operate in dealing with the manure and disease questions.

For trellised varieties, a favourite distance is 8 feet x 7 feet, but this might with advantage, be made 9 feet x 6 feet in many instances. Should the fertility of the soil warrant the assumption that very strong vines will result, then the distance should be increased accordingly. The smaller number of stronger vines must return yields that will compensate for the greater area occupied by each individual. Put briefly, a line of trellis wire should be occupied from end to end with fruit-bearing wood if it is to be utilised to the best advantage.

Marking out the Vineyard.

In order to secure regularity and uniformity, the whole plan of the vineyard should be laid out prior to the vines being planted, and a definite idea should have been formed as to the requirements of the varieties that are being planted under the conditions. Once this plan has been decided upon, there is no great difficulty in setting out the rows and the positions to be occupied by the vines.

The first point is the setting up of the base lines for working. Headlands for turning the teams must be allowed for, and, generally speaking, a space of 20 feet is ample for this purpose. Where the vines are to be trellised, a headland of 20 feet at each end of the rows will be sufficient; on the other two sides the rows need not exceed 8 feet from the boundary fence. When a vineyard is to be bush-pruned and therefore left untrellised, cross-cultivation is possible, and therefore headlands should be arranged on all four sides of the blocks.

Probably the plan most generally adopted is to mark out the rows by means of stakes. The base lines are set up first of all, measured distances marked out to represent the spaces between the rows, and then the distances between the vines in the rows are marked off. The intermediate positions are next determined by sighting in two directions, and the positions marked with stakes driven into the soil. Finally, the young vines are planted to these stakes.

A plan which has a good deal to recommend it is the use of a plough in conjunction with stakes. The distances representing the width of the rows are measured and marked by stakes at either end of a block that is to be planted. Two or three intermediate stakes are set up by sighting, as a guide to the man on the plough. Starting from the one end, the furrow is opened out with the stake line as its wall, leaving a clearly defined line for planting the vines. The fact of opening out a good deep furrow is an advantage, as it reduces the amount of labour required to make the holes deep enough to take the vines. It certainly requires a good teamster to so mark out the land, but it is not beyond the skill of an experienced ploughman. The intersecting points are marked by cross sighting to stakes, or, if the plots are not too wide, a light steel wire stretched between the outside pegs will mark the points against the furrow wall where the vines are to be placed.

There is a third system of marking out which has its advantages in dealing with uneven or undulating land in which it may be difficult to follow lines of stakes. It consists in using a marker constructed with two low wheels with somewhat sharp V-shaped or pan-shaped (⌴) tyres. The idea is to mark out the land, after it has been well worked down to a fine surface, into a series of parallel lines. These lines represent the width of the rows and are made by always running one wheel on the previous mark. The land can be crossed in the same manner, and the points of intersection give the positions of the vines. On plain land it has no advantage over the previous systems, but it is useful on hilly land because the lines always remain parallel.

Planting the Vines.

The land being well prepared, worked and marked out, it is ready for the young vines to be planted.

So long as planting is done during the dormant period it does not, as a rule, matter very much just what period of the year is selected. July and August are usually looked upon as the best months for the purpose, though in some cases the work is considered best done in September. Generally speaking, it may be said that the lighter the rainfall the earlier should the vines be planted. In a district of light rainfall early planting enables the roots to become well set before the weather gets too warm in the spring. In such conditions, too, root formation will commence earlier than in a wet district, and it is wise to take advantage of this fact. Early planting in wet localities, more especially upon the heavier soils, is not an advantage. The soil is too likely to be over wet, and the vines cannot be established with such satisfactory results. The excessive cold and wet render the conditions more likely to create a percentage of failures. Later planting under such circumstances enables the work to be done more satisfactorily, and the natural amount of moisture ensures a sufficiency to keep the young vine going. Where irrigation is possible, and even in seasons where the rainy period is prolonged, planting can be extended over September and early October, but normally this is too late.

In establishing a vineyard plain cuttings or rooted cuttings can be used when the plants are ordinary European (*Vinifera*) varieties. When phylloxera-resistant vines are used, the plan usually adopted is to plant grafted rootlings or ungrafted rootlings with a view to field grafting at a later period. Planting unrooted resistant cuttings direct into the vineyard is not, as a rule, satisfactory.

The simplest form of planting is the case of the cuttings. All that is required is to make a hole with a bar about 1 inch in diameter and deep enough to take the cutting, so that the second or top bud is about upon a level with the surface. The soil is then packed around the cutting by means of the bar used for making the hole. Every care should be observed to see that the base of the cutting is bedded firmly in the bottom of the hole. Failing this, it will not root satisfactorily.

When rooted cuttings are to be used, that is, plants which have been in the nursery for one season, a hole of sufficient depth must be opened out to accommodate the established root system. Such a young vine has a number of roots springing from its base, as well as others at various points throughout its length. Preparatory to planting, the base roots are shortened back to a uniform length of about 3 inches, and all the lateral ones are completely removed. The growth may be cut back to a single spur of two buds prior to planting, or else it may be left entire and pruned back at some later period. The same preparation holds whether the young vines are grafted or ungrafted. The prepared vine is set into its position in the hole upon some fine surface soil. Similar soil is filled in about the roots and well tramped down to exclude all air pockets. Finally, the hole is completely filled to the surface, leaving the topmost 3 or 4 inches loose.

In the case of grafted American rootlings, it is recommended that after planting the whole vine be mounded over. This can be done by treating individual vines and mounding with a spade or hoe, but in large areas the cheapest plan is to throw up a light furrow on either side of the row, forming a crown. This mounding not only prevents drying in case of warm weather coming in quickly, but it serves to delay the bursting of the buds slightly, and thus enables the young roots to make better development. A stronger start is the result—and a very desirable one.

Leaving the top growth unpruned at the time of planting has the same object. This is more particularly so in the case of phylloxera-resistant stocks, which develop their root system more slowly than European varieties.

The vines at planting are mounded up with the top of the cane protruding. With the movement of the sap in the early spring, the top buds break into growth, and the vine is then pruned back to a single spur of two buds with the object of further retarding the bursting of these buds. This system is always recommended by European growers, but in Australia the prevailing plan is to prune back when planting and to mound the vine right over. Often the mounding is neglected, but it is a wise precaution to adopt, more especially when the spring is fairly dry.

A common mistake made in planting young vines is to set them too high out of the soil. The best plan is to plant them well down, leaving about 4 inches, including the spur, above the surface. In the grafted resistant cuttings this brings the graft just above the surface where scion roots are easily dealt with.

As the growth develops, it will push its way through the thin layer of soil covering the vine, and finally the mounds are levelled down during the general cultivation.

VINEYARD NOTES FOR AUGUST.

THE bulk of the ploughing will have been completed this month, and in some districts the vines will be bursting into growth. Preparation for spring cultivation will be in view.

In most districts pruning should be completed during the month, although in places subject to late frosts it is an advantage to postpone the pruning as late as possible. It encourages late bursting, and therefore late-pruned vines frequently escape being cut down by the frosts.

It will be necessary to keep a close watch upon disease as the vines begin to burst. In all areas subject to black spot, it is assumed that winter treatment was carried out while the vines were yet dormant. This should be followed up by a spraying with Bordeaux mixture (6—4—40 formula), when the young growth is from 2 to 3 inches in length. Even though the grower considers the operation quite unnecessary, it is a wise precaution to make this application. Future sprayings can be regulated according to climatic conditions.

Incidentally it must be remembered that sprayings for black spot and downy mildew are concurrent. Growers must not be deluded into the belief that because the past summer proved unfavourable to both these diseases, such will be the case next season. The rapidity with which downy mildew developed at the latter end of last season, shows but too plainly the danger which may arise from neglect. Rainy conditions during the summer will certainly lead to a diseased condition of the vines, the consequences of which may be fatal to the whole crop.

Although it is too early in the season to worry about oidium, supplies of good quality sulphur should be in hand for any emergency.—H. E. LAFFER, Viticultural Expert.

Spring Work in the Apiary.

W. A. GOODACRE, Senior Apiary Inspector.

In many localities this spring apiarists will have colonies that are weak in population, largely owing to the drought conditions experienced last season. These colonies will need some care to save and to bring them to a progressive state.

When the bees become active in the spring, select a nice sunny day and make the colonies as comfortable and compact as possible. If, for instance, a colony can only cover five frames, the bees being in the lower storey, then remove any supers and leave only six frames. Next put in a division board or follower, and pack paper in the space to about 3 inches from the top; a small feeder or container should then be placed on the paper and against the follower. If the bees are in the first shallow super, leave them there; take out any surplus combs from the super only, put in a follower, and treat the super as mentioned for lower storey. There should be at least 5 lb. or 6 lb. of honey in the hive, and if this is not the case they should be fed to make up that quantity. If a frame of honey cannot be found, feed sugar syrup, made of equal quantities of sugar and water boiled for a few minutes.

Queenless Colonies.

It will not be worth while to meddle with weak colonies that have no queen. They should be united with a colony of medium strength that has a queen. To do this, make each colony as compact as possible, as stated above, but packing the paper in the one to be removed in such a manner that it will not fall out. All that is required is a sound sheet of newspaper; then as soon as the bees have finished work for the day carry the queenless hive to where it is to be placed, remove the cover of the other hive, place the sheet of newspaper, and lift the queenless colony carefully on top, leaving the bottom board stationary. There will be very little trouble about the bees going to the old stand when treated this way, more especially with a queenless colony.

In many cases the apiarist desires to save the queen in an exceptionally weak colony. A desirable method to adopt in this case is to obtain a queen excluder and a sound sheet of newspaper, and unite the weak colony with a populous colony by placing the paper, then the excluder, and, finally, the weak colony on top of the lot. In many cases there will be a fair colony with the queen in a few weeks, which can be given a start on a new stand.

Stimulating Weak Colonies.

Care must be exercised in these cases, for the weather is usually somewhat changeable, and if the bees are stimulated to breed in excess there will be trouble. What I advise if the bees are breeding, is to give small quantities of feed—just sufficient to keep the bees in good heart. Good results have been attained by feeding a quarter of a pint of syrup to each colony every second day. There will be no need to interfere with the colony when feeding, as the cover can be removed just sufficiently to clear a portion of the feeder. The best time to give the feed is after the bees have finished work for the day.

"Spring Dwindling."

With colonies affected with this disease, it will be noticed early in the spring that a considerable number of bees die off at almost an alarming rate, and the novice is often afraid that his colonies are being gradually decimated. Then come normal conditions and a quantity of nectar is gathered, the dwindling gradually diminishing and the colony becoming progressive, though it may take some time to become populous.

In most cases the trouble is that the colony had insufficient young bees for the winter, and a large number of the old bees succumbed in their efforts to work in the spring. These old bees will die about the entrance, and are even left inside the hive at times. The symptoms often give the novice the idea that he has paralysis in his bees in a virulent form.

Spring dwindling is also caused by carelessness in wintering, such as leaving colonies in larger hives than is necessary to accommodate them, and insufficient protection from cool draughts through the cluster of bees. In fact, anything that tends to lower the vitality of the bees during winter will have the effect of causing losses in the spring.

Have a vigorous queen and favourable brood combs in the autumn, ample winter stores, so that the bees will not economise feed, no draughts through the cluster in the winter, and do not allow excessive space during winter, and there will be few losses in the spring.

THE DEPTH TO PLANT BANANAS.

WITH a view to determining the depth at which bananas should be planted for best results, an experiment was arranged at Wollongbar Experiment Farm, sets being put out in March, 1917, at 6, 9, 12, 15, 18 and 21 inches deep. So far no fruit has been harvested from the plots, none having matured; but the best stool at present is from the plant set 15 inches deep, it having five stems and two suckers. The next best stool is that planted 12 inches deep; it has four stems and four small suckers. The plant put in 9 inches deep has three stems and three suckers. The stools put at 18 inches and 21 inches have only two stems and one sucker each, while the set put in 6 inches deep died at the start. The test will not be conclusive until the plants mature fruit, but in the meantime the results afford some indication of the best depth.—A. H. HAYWOOD.

Poultry Notes.

AUGUST.

JAMES HADLINGTON, Poultry Expert.

REFERENCE was made in last month's notes to the value of early-hatched chickens, but so far as can be judged at present there is almost general backwardness in the commencement of hatching this season. Apparently the high prices offering for the eggs on the market are proving too great a temptation for many poultry-keepers, but the effect of the delay in the hatching will certainly be a scarcity of early-hatched stock from which to breed next winter. August and September stock may, and mostly do, prove good autumn and winter layers, providing the development has been all that it should be, but chickens hatched after the middle of August are scarcely forward enough to breed from early the following winter.

Lessons from the College Competition.*

When in contact with those of the general public who are interested in our industry, one is met with the question, "Does poultry-farming pay?" We might answer in the affirmative, with qualifications that will only be met by another question, "Then why is it so many fail?" Perhaps the strongest argument I can use in answer to the first question is that there are many who are actually making it pay, notwithstanding the high prices of food and other materials. A few figures will go to show that if ever poultry-farming was profitable it should be so now, particularly as we claim to have increased our average production considerably during the currency of the Hawkesbury Agricultural College Egg-laying Competitions.

This claim has recently been disputed, but in so far as laying competitions are concerned, it is easily substantiated, and I maintain that the competition results should be a reflex of what is possible. Whether egg-production has correspondingly increased on our farms is, I think, open to question, and if that opinion is right it is time we undertook a little self-examination with a view to discovering the cause.

For obvious reasons, it would be foolish to expect the same egg-laying results from flocks on a farm as are obtainable in competitions, although similar results are obtained from small lots almost anywhere. I have, therefore, taken twelve dozen per hen as a basis of average production upon which we may compare the cost of feeding with the average amount received for eggs, so that we may arrive at the return per hen over cost of feed during the last sixteen years. I think it will be agreed that twelve dozen eggs per hen per annum from an ordinary flock consisting of half first-year and half second-year hens is not too much to expect, but I fear that it is much in excess of what is actually being realised. If it were not so, then, as my figures will show, poultry-farming would be a more prosperous pursuit than it appears to be at the present time.

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* In compliance with requests, the paper read by Mr. Hadlington at the Poultry Conference at Hawkesbury Agricultural College on 14th June, is reproduced under this heading.

The following shows the return over cost of feed on a twelve-dozen basis:—

Year.	Cost of Feeding.		Average Nett Price of Eggs.		Total Value of Production.		Nett Return per Hen over Cost of Feed.	
	s.	d.	s.	d.	s.	d.	s.	d.
1903–4 ...		9¾	1	3¾	15	9	9	11¼
1904–5 ...	4	5½	1	0	12	0	7	6½
1905–6 ...	5	3½	0	11½	11	6	6	2½
1906–7 ...	5	10	1	0½	12	6	6	8
1907–8 ...	7	0	1	3½	14	6	7	6
1908–9 ...	7	9½	1	3¼	15	3	7	5½
1909–10 ...	6	9	1	5¼	17	3	10	6
1910–11 ...	6	5½	1	2	14	0	7	6½
1911–12 ...	6	1½	1	2½	14	6	8	4½
1912–13 ...	7	3½	1	3½	15	6	8	2½
1913–14 ...	5	9	1	2½	14	6	8	9
1914–15 ...	6	9½	1	2	14	0	7	2½
1915–16 ...	7	7	1	4½	16	6	8	11
1916–17 ...	6	10	1	3¾	15	9	8	11
1917–18 ...	7	8	1	4	16	0	8	4
1918–19 ...	7	10	1	5½	17	6	9	8

It will be seen from these figures that the average nett prices received for eggs (after deducting commission and freight charges) have very closely followed the increasing cost of feeding, and upon the basis of twelve dozen per hen the return per hen over cost of food has, practically speaking, increased on an average of something like 1s. per head since 1908-9.

The foregoing figures have been taken from our competition results, commencing with the second year's test, the first year's conditions not being considered comparable with the succeeding years. Starting, then, from the second year, we find the average egg-production for that year to be 163, or thirteen dozen and seven eggs per hen, while in 1918 we had reached 206, or seventeen dozen and two eggs per hen—an increase of forty-three eggs, or three dozen and seven eggs per hen.

The significance of these figures is that the price of eggs, despite what one hears alleged to the contrary, is rather more than keeping up with the cost of feeding, although perhaps scarcely increasing fast enough to cover the extra cost during the last three years of other materials used on the farm.

The difference of three dozen and seven eggs in the average egg-production during the currency of the competitions, represents an increase of 26·38 per cent. per hen. A margin of 26 per cent. one way or the other would mean the difference between a highly profitable and a non-paying concern. Here we have a concrete fact. The point is, have we increased the egg-production on our farms in the same ratio, and if not, why not? I think if we face this question squarely we must come to the conclusion that our profits from poultry-farming have not increased to the extent of the figures shown, and if they have not we should do some hard thinking with a view to finding the cause.

Previous to the advent of laying competitions we have no reliable data as to the laying capabilities of hens, but what we do know is that egg-farming in our own State could be made to pay in those times.

Now, we have shown that the extra cost of feeding has been followed, very naturally, by increased prices for our eggs, though, perhaps, not sufficient to cover the higher cost of materials other than feed during the last three years. If, therefore, we have not increased our egg-production, poultry-farming would be somewhat less profitable during that period.

I estimate that there has been an increase in cost of materials used on the farm during the period mentioned of about 60 per cent., but since only about 10 per cent. of the total expenditure on running a farm would be on materials other than feed, it will be seen that 6 per cent. of the total expenditure would represent the increase during the last three years. Thus if our production had increased by 26 per cent. we would still be substantially to the good.

The deduction to be drawn from this is that if egg-production on our farms had increased in proportion to what the College competition has shown to be possible, poultry should be at least 20 per cent. more profitable in 1918 than 1904. If that is so, why is it that so many failures occur and that poultry-farmers in general are not more prosperous? Why is it, indeed, seeing that for the past sixteen years the poultry-farmer's endeavour has been concentrated on the factor of inheritance of high fecundity?

Has this inherited character been confined to our competition birds? Should it not have enleavened itself right through our flocks? If it has not, let us seek the cause. Is it not that we have depended too much upon the factor of inheritance, and have paid too little attention to the physique and environment of the birds themselves?

I want to say this, that all my observations point to the conclusion that much of the good that we might have gained from the inheritance of high fecundity is being lost through a lack of appreciation or want of knowledge of the essentials necessary for its maintenance. If we want proof of this we have only to look back over the last four years' tests, and see the improvement in the average production that has followed the insistence on better physique in the birds entered for competition. I think this should be convincing evidence that the inheritance factor, unless backed up with the essentials referred to, must fail. I will go further, and say that in my opinion, taking into consideration the known normal fecundity of hens, the inheritance factor is of less significance than those essentials.

It is not the innate low fecundity of our hens that is the cause of failure, but the want of knowledge and lack of method in our work. So long as we trust to blood alone to produce the desired result, we shall meet with disappointment. We must have the inheritance factor plus a breeder's knowledge of the physique, type and character of the birds.

I think Australia can claim to lead the world in the matter of egg-production, and I doubt if there is any part of the world where a better average standard of utility stock is kept, but if my information is dependable, there is everywhere a great need for improvement.

This paper was not intended to show the profits to be derived from poultry-farming so much as for the purpose of comparison between the returns per hen at the commencement of the competitions and now. However, incidentally it will be some guide to the probable returns from our hens over food. But in this connection there are some important factors which must be taken into account. The first is that my average estimated production is twelve dozen, based on a yearly average price, but a hen laying more than twelve dozen would lay more eggs in the months during which the highest prices were ruling. As some set-off to this, she should consume somewhat more food in proportion to the number of eggs laid, though not in proportion to the increased value of those eggs.

Our cost of feeding is based upon the average laying in the competition, which ranged from thirteen dozen and seven eggs in 1904 to seventeen dozen and two in 1918, a difference of three dozen and seven eggs. It follows that without any increase in the price of food the cost of feeding would be somewhat higher.

I estimate that the hens laying seventeen dozen eggs would consume probably one shilling's worth more food than the twelve-dozen performers, and this, other things being equal, would reduce the cost of feeding the twelve-dozen-egg hens by that amount during the later years.

But another factor we must examine is, that the average price received for eggs is based upon the production in the competition, where, of course, hens would lay a higher average during the months in which eggs are high in price. This would have the effect of increasing our average return, probably to the extent of 1s. for the product of each hen, and as this would balance the first-mentioned shilling we can, I think, accept the table much as it stands, as very closely approximating to actuality. I must, however, remind my hearers that the margin over cost of feeding is not all return for labour. Out of this margin must come incidental expenses, also interest and depreciation on plant, and the balance is what is left for labour.

It is for the poultry-farmer to say whether he can afford to neglect the proposition I have thus put forward. In the course of the College competitions, the average laying has increased so appreciably as to represent a substantial addition to the returns. That the poultry-farmer has kept pace with that advance, I have indicated to be a matter of considerable doubt. The means by which the returns of the average farm might be made to approximate the increase in the competition have also been indicated. Is the poultry-farmer going to allow such opportunities to escape him—opportunities that make all the difference between a comfortable living and a continual struggle? The competitions have shown what can be done. It is for the poultry-farmer of this State to profit by the lessons that have been brought out.

Orchard Notes.

AUGUST.

W. J. ALLEN and W. LE GAY BRERETON.

Spraying.

IT was mentioned in last month's notes that to control leaf curl of peaches and nectarines, lime-sulphur should be applied at winter strength while the trees are quite dormant, early application having given the most perfect control. If, however, a grower has been unable to spray his trees during July, he should not be deterred from doing so at once, even if the buds are well swollen or just showing a tiny green tip, for this is a case to which the saying "better late than never" truly applies. Trees sprayed at this later period did not show such perfectly satisfactory results in the experiments as those sprayed earlier, but they were still much cleaner than the unsprayed check trees, plainly showing that the later application was well worth while if it could not be made earlier.

Where, too, the earlier application of lime-sulphur has not been made, it is worth while extending the later one to other stone fruits as well, if they are not in too advanced stage, to check other fungus diseases, such as rust, freckle, shothole and scab. It is also a valuable safeguard against San José scale.

If apple and pear trees are free from San José scale, the application of lime-sulphur at winter strength can be delayed till the spurs on each variety begin to crack, but before the enclosed blossom buds are actually showing, or perhaps when a few are just discernible. If delayed till then, the application is more likely to kill any black spot of either of these fruits that happens to be breaking into activity early. It also serves to kill any specks of San José scale that have escaped detection, and so acts as a safeguard against this pest.

But it cannot be too forcibly emphasised that when San José is actually discovered, it should be dealt with as soon as possible.

Miscible Spraying Oils.—It is well, perhaps, to draw attention again to the usefulness of miscible oils in killing San José scale where the latter has become thick on a tree. The precautions suggested last month for the prevention of harm to the trees when a heavy drenching is being given should be recalled. The present month is a good time to apply these oils to apple trees for the control of woolly aphis, and if the trees have not previously been sprayed with lime-sulphur. Where the trees have been cleaned up of woolly aphis in the autumn, growers should make a trial with tobacco wash or one of the tobacco extracts later in the season, but before the trees become too leafy to allow of thorough application.

Tobacco wash can be mixed with the lime-sulphur in the "delayed dormant" spray just mentioned, or later on with either the "spur-bursting" or "pinking-stage" application. The late application of tobacco wash or a tobacco extract combined with lime-sulphur at either the spur-bursting or pinking stage was found, at the orchard at Glen Innes Experiment Farm, to be just as effective in killing and keeping the woolly aphis away from trees long into the following summer as an earlier application of a miscible oil. The advantage was that the combined spray could be put on in one application, and that it did not prevent the use of the lime-sulphur as a dormant or delayed-dormant spray.

Late Spraying of Citrus Trees.—There have been several inquiries of late as to whether citrus trees may be sprayed for red scale or brown olive scale in the winter. Though we know of no case where the use of lime-sulphur during the winter on citrus trees has taken fruit off or damaged the trees, still it is advisable to avoid its use during the coldest months. However, should trees be bad with red scale, it would be better to risk some damage from the spray than the certain damage that the scale would do before the correct time of spraying came round; but it should be remembered that by the winter the scale has got older and its casing harder and more difficult to penetrate, and the spray will in all probability give less satisfaction than at the proper season. The killed scale may also fail to crack off the fruit properly before picking.

If citrus trees are sprayed during the cold months, the operation should not be carried out too late in the afternoon, but time should be allowed for the spray to dry before the air gets frosty.

Winter Swab for Vines.—Either the sulphuric acid solution, or the combined sulphuric acid and sulphate of iron, should be applied as a swab to grape vines subject to black spot just prior to the buds breaking in the spring. These swabs delay the attacks of spot, and give a better chance of getting on the later protective application of Bordeaux mixture.

Brown Spot of Emperor Mandarin.

Some growers have been of the opinion that, though their crops were reduced considerably by this disease, their trees carried such heavy crops they could still market profitable crops without treatment. This season the losses from this disease were particularly severe, however, and it seems an opportune time to repeat the advice given in these notes for the past two years.

The disease attacks both the wood and the fruit, and the first measure to be taken is to reduce infection by removing all diseased and dead wood, and to burn it, as far as practicable, soon after removal. Where possible, in removing such wood it is advisable to cut a couple of inches below, so as to reach healthy wood. This has to be done very thoroughly, and in bad trees it means severe cutting the first season. It is slow and tedious work; and in order to get it through before the first application of spray is made, it should be commenced this month, though, as a rule, citrus trees should not be pruned till the spring has properly set in.

The only spray that gave satisfactory results in the Department's experiments was Bordeaux mixture in the summer strength (6—4—50). The first application should be made when the blossom buds are showing white, a little before blossoming. The second application, with the same mixture, should be made after the fruit has set and before it has grown quite as large as green peas. The number and period of later applications are governed by the weather.

When the disease has become firmly established in trees, the results the first season may be disappointing, as was actually the case with trees on which the Department experimented. However, the treatment was persisted in, and by the second season very satisfactory results were obtained. The experiments were continued over a series of seasons to ascertain if these results could be maintained during seasons favourable to the disease, and this ultimately proved to be the case, and from the treated block of trees very little fruit was lost from spot, though the losses from spot on the check block of untreated trees in some seasons of the experiments were severe.

The cutting may seem drastic and the spraying excessive, but it should be remembered that as the disease is brought under control less wood is affected, and consequently less cutting out has to be done. Except for the first two applications, the spraying can be reduced in dry years.

AUGUST NOTES FOR TOBACCO-GROWERS.

FROM the beginning of this month, tobacco-growers will be sowing their seed-beds. It has been observed that in many cases beds have been sown too thickly, and eventually these have to be drastically thinned out, but growers will be well advised to avoid such a condition of things, for weedy and spindly plants must be expected from beds sown too thickly, and much time is lost in transplanting a second to the spaces in the field where the first plants have died off. One *level* teaspoonful of seed is sufficient to sow a bed 4 feet wide by 25 feet long.

Do not select a site for the seed-bed which has been used previously for the purpose. Choose a spot that is well drained and that gets the morning sunlight.

Some growers will have noticed "stem grubs" or "tobacco leaf miners" are prevalent in their plants. The treatment for the pest, whether actually present or only feared, is, when the plants have four leaves, to spray the beds with two teaspoonfuls of arsenate of lead to one gallon of water, and to repeat the application four days later.—C. J. TREGENNA, Tobacco Expert.

TO POISON HARES.

EITHER of the following methods is satisfactory, wrote the Chief Inspector of Agriculture in reply to a query:—(1) Finely powdered strychnine, thoroughly mixed with quince jam at the rate of 1 oz. strychnine to 7 lb. jam, put out in baits about the size of a walnut on chips or clods. (2) Finely powdered strychnine lightly dusted on pieces of apples, turnips or carrots.

Agricultural Bureau of New South Wales.

Suggested Subjects for Bureau Meetings.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion:—

Have you tried sprouting potato sets before planting them, with a view to ensuring earlier development? What have been the results, or what do you think they would be under your conditions? Some farmers plant two and three weeks before the danger of frost is past, arguing that it takes time for the tops to appear and that serious damage is unlikely, even if a frost should occur. Would you expect this method to succeed in your district, or does early development not appeal to you, and why?

Have you considered the advisability of growing more crops for green feed, silage, &c., with a view to increasing the capacity of the farm for carrying sheep? What influence do you think such a practice would have on the profits from wheat and from the farm generally? What crops would you expect to best suit your conditions?

What method do you adopt of culling unprofitable cows in your herd? Are you sure all your cows are earning the cost of grazing and the labour spent on them? If not, have you thought of herd-testing in connection with the matter? The spring is the most suitable time to start testing, and the Department is prepared to afford assistance and advice. Do you think a testing unit could be formed in your district, and how many cows would be offering for the first twelve months?

What spraying have you done in the orchard this winter? Very encouraging results have been obtained with lime-sulphur in the control of leaf curl in peaches and nectarines; have you tried it? How many applications are you making for brown rot, and at just what stages? What combined sprays do you intend to use this summer?

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Bimbaya.

The monthly meeting of this branch took place on 10th June, when the subject of the age at which it is desirable to mate dairy heifers was discussed.

A majority of the members was in favour of early mating, that is, between 15 and 18 months, especially if the heifers were of robust constitution. Some members favoured mating at 2 years and later, contending that early mating weakened the constitution. Against this it was argued that the majority of heifers tend to beefiness if not mated reasonably early. Several members favoured early mating, extending the first period of lactation as long as possible, and regulating the second mating so that the heifer would have a good spell during which to build up her constitution before the second period of lactation.

Clovass.

At the monthly meeting held on 10th June, Mr. W. G. Cocks read a paper on the subject of pig-raising. He particularly favoured the Berkshire-Poland China cross as the best commercial pig. The Poland China, he said, was a large breed that showed weight on the shoulders, made good quiet mothers, and great milk producers. The improved Berkshire, being of a smaller type, were hardy and thrifty, and showed a great depth of ham and side. He considered the cross was the only one that would grow and keep the prime appearance that is essential in a commercial pig. The small breeds, if forced, produced fat without growth, and the larger breeds were not suitable as suckers or porkers.

Cordeaux-Goondarin.

At the monthly meeting, held on 12th June at the residence of Mr. R. J. Fishlock, a paper was read by Mr. E. Rees on winter spraying. This operation, he said, should be made compulsory, as it was quite as important as the spraying for codlin moth. All spraying should be done thoroughly, being the one work in an orchard that would not admit of slumming. Lime-sulphur he considered to be the best winter spray, being very effective against San José scale and a preventive for fungus diseases. He always made his own lime-sulphur, mixing 100 lb. sulphur, 53 lb. lime, and 50 gallons of water, and allowing the whole to boil for at least one hour from the time that it actually commenced to boil. Of this mixture he used 1 gallon to 7 gallons of water for the winter strength.

Departmental Note.—In some cases where San José scale was very thick on the branches of trees, the Department has seen an oil spray more effective than lime-sulphur.

Cotta Walla.

At the May meeting of this branch a paper was read by Mr. T. W. Howard, from which we extract the following:—

The Most Suitable Plough for the District.

A very common question is, What is the best plough? Every agriculturist should solve this question, for good ploughing is the foundation for a profitable crop. It has been said by experienced men that no after-working of the land can make up for bad ploughing. The preparation of the land for sowing generally consists of ploughing in January, February or March, cultivating with the spring-tooth, then harrowing and rolling to secure a suitable seed-bed, and sowing with the drill.

Another comparatively new method, one which every year is becoming more popular, is a second ploughing of the land six or eight weeks after the first ploughing, in place of spring-tooth cultivating, for not only does it produce a better tilth, but it is a more effective method of destroying weeds. The period of cultivation may be said to extend from January to May, the first three months being, as a rule, the driest in the year.

The disc plough has now had a fair trial, has been used and tested in all classes of soil and under all weather conditions, and has proved itself the best all-round plough for the district. It is by far the best for working heavy soils, for whether wet or dry they are not good cleaning soils. For working light soils there is really no choice of plough, as both sorts do excellent work.

The disc is preferable for ploughing land that has a heavy coating of weeds, grass or long stubble, for it will cut through any trash, and does not block and clog like the mouldboard. Perhaps no feature is more outstanding than the thorough manner in which it ploughs and pulverises the soil, and consequently a certain amount of after-working of the land is eliminated to obtain a good seed-bed. The advantage of the disc is shown in ploughing fallowed land, for it grips the hard bottom and keeps to the right place, whereas the mouldboard slides along on the bottom and drags anywhere, for the surface soil is loose and of no support to it.

Every practical farmer considers the cost of ploughing, and here the disc scores many points. As a fair average, a disc costing 35s. at present (though only £1 before the war) will plough 100 acres without any repairs. On the other hand, the shares of a mouldboard plough, which cost 12s. (pre-war price, 7s.) will require to be dressed every second day if the ground is hard. Unless the farmer has a knowledge of blacksmithing and the necessary appliances, the taking of ploughshares to the blacksmith will result in a lot of lost time as well as expense. To estimate the life of a share is rather difficult, for it may vary considerably according to the land and the number of times it is "laid," but I think about 15 acres is quite up to the average. I believe that the upkeep of a mouldboard plough for a ploughing season will, on the average, be about three times that of a disc, for besides shares and coulters, perhaps the boards will require attention.

The handiest size of plough is the two- and three-furrow; larger ploughs are not popular, perhaps on account of the small paddocks, and those who have tried them have, after a year's experience, mostly fallen back upon the smaller implements.

Some advocates of the mouldboard claim that it turns more stubble under than the disc. While acknowledging this to be correct regarding good cleaning soils, the advantage of ploughing in stubble is practically nil if the after-preparation of the land (such as working with the spring-tooth or the plough) brings the stubble to the surface again. Stubble rots slowly, and the advantage of ploughing it in would only apply to a long fallow. Regarding results, I am not aware of any straight-out tests between the two classes of plough, but, judging from the average yield of farmers who stick exclusively to either sort, and after making fair allowance for the quality of the respective land cultivated, my decision is with the disc. It has proved a distinct acquisition to the farming community, because (1) it ploughs well and thoroughly; (2) it makes for earlier preparation of the land and earlier sown crops; and (3) it induces cultivation of the strong, heavy soils, which were often discarded because of the difficulty of working them with the mouldboard plough.

The branch met again on 10th June, when a paper was read by Mr. E. Herman on the Milking Shorthorn. Mr. Herman dealt interestingly with the history of the breed and its acclimatisation in Australia, and described also the points of the cow that made for constitution and deep-milking habit. One recommendation for the Shorthorn was the fact that there was no need to sacrifice the bull calves by selling them for paltry sums. It might have been profitable in the past to raise calves that were not of a beef-producing strain, but the shortage of steers at the present time was so acute that the profit from Shorthorn steer-calves more than made up the difference, if any, between the returns from cows of this as against other breeds. Moreover, the Shorthorn could be made either a beef or butter breed by selection, testing and culling.

Glenorie.

A meeting of members was held on 31st May, when a general discussion took place in connection with the proposed Packing and Grading Fruit Bill. As members could come to no definite decision, it was decided to pass it on for discussion at the annual conference.

A discussion also took place on the effect of brown spot on mandarins, the cause of it being put down to the very adverse season. The long spell of dry weather, it was considered, would check the flow of sap and growth of trees. This, followed by humid weather in the autumn, helped to spread the disease. Members had seen very little brown spot in the district.

DEPARTMENTAL NOTE.—Dr. Darnell-Smith points out that brown spot is purely a fungus disease, and the only way in which the dry months of last summer and autumn could favour it would be in reducing the vitality of the trees and thus their resistance to the attacks of the disease after rain. The treatment is rigorous cutting out of affected parts, and spraying with Bordeaux mixture.

Garra-Pinecliff.

A meeting of members was held on 12th June, when a short discussion took place on the harrowing of the growing wheat crop.

A number of members gave an account of their first experience of harrowing. Most of them said they did not finish the paddock, as it pulled up too much wheat. The results, however, showed that they were wrong. Mr. S. W. Packham stated that he knew a man in the Eugowra district who had heard a good deal about harrowing wheat. He therefore started on the outside, but before he got to the other end he stopped and had a look at it. "If that is harrowing wheat to make it grow better," he thought, "I would like to get out over the fence." But he was well satisfied when the stripper went in. He was never afraid of pulling up a little afterwards.

Lidcombe.

Mr. H. E. Laffer, Viticultural Expert, gave a pruning demonstration under the auspices of this branch at the garden of Mr. H. Laman, Lidcombe, on 28th June. In consequence of the prevailing epidemic there was a limited attendance.

Mr. Laffer's demonstration was on the lines of his lecture of a few months previous. It was of a very practical nature, and was much appreciated.

Middle Dural.

On 16th May a discussion took place in this branch on the mixing of manures for orchard purposes. The Chairman, Mr. R. Hawkins, stated that a mixture of bonedust, superphosphate and sulphate of ammonia would make almost a complete fertiliser, with the exception of potash.

The annual meeting of members was held on 13th June, when the following were elected as office-bearers for the ensuing year:—Chairman, Mr. C. W. Roughley; Vice-Chairman, Mr. R. Roughley; Hon. Secretary and Treasurer, Mr. A. E. Best; Auditors, Messrs. J. T. Eagle and G. W. O'Connor. There was a credit balance on hand of £3 14s. 10d.

A discussion followed the ordinary business on the mixing of manures.

The members have discussed the subjects suggested in the *Agricultural Gazette* from time to time, with profit to all concerned. The unanimous opinion was in favour of the co-operative marketing of fruit, but it was felt that the great difficulty was the finding of sufficient capital to enable the venture to compete with large proprietary interests. Many co-operative ventures had failed because of limited capital. On the subject of green manuring, the secretary reports that the discussion showed that many members practised green manuring, though the success of the method depended entirely upon the nature of the season. Apart from that, however, it was agreed that it was essential to the maintenance of the soil in a profitable condition. The unanimous opinion was that for planting citrus, the spring—say the end of July or early in August was the best time.

Miranda.

At the general meeting of members held on 26th May, Dr. Darnell-Smith, Biologist of the Department of Agriculture, gave a seasonable lecture on the diseases of fruit trees. He spoke on the different fungus growths known to science, showing their method of propagation and their harmful effects on fruit trees, more especially on the apple and pear. Dr. Darnell-Smith impressed the necessity of spraying, otherwise fruitgrowers would have to contend with the annoying experience of trees dying out or dying back. He advocated spraying with Bordeaux mixture in preference to lime-sulphur.

On Friday, 6th June, a pruning demonstration was given by Mr. W. le Gay Brereton, Assistant Fruit Expert, at the orchards of Mr. Gurney in the morning and Mr. Wilkinson in the afternoon. He gave some excellent advice and information in a practical manner. Such demonstrations are much valued by members, the secretary reports, because they keep the grower up to date.

At a meeting held on 12th June a resolution was passed appreciating the steps taken by the Metropolitan Meat Industry Board in supplying a suitable meat meal for poultry.

Spencer.

At the last monthly meeting of this branch a paper on pea-growing was read by Mr. E. C. Allen, of which a condensation follows:—

PEA-GROWING.

Pea-growing is one of the best side lines for the orchardist who is waiting for returns to come in. The crop does not impoverish the soil to any great extent, and if the haulms are ploughed in after the crop has been gathered they make excellent manure, or if reaped and stored in a dry shed they will keep a considerable time and make good fodder for cattle.

The site should be a sunny one with a north-easterly aspect, and well drained. The ground should be well prepared, and then drilled about 4 feet apart, so as to allow of easy cultivation with the Planet Jr. implement. The peas should be dropped about 3 to 4 inches apart for the spring crop, but in the case of the autumn crop the plants stool out considerably, and the peas can be dropped about 4 to 5 inches apart. Soon after the seedlings are up the soil should be chipped on each side of the row, pulling the earth slightly towards the vines, and afterwards running the cultivator through the centre. At about 6 inches high they should be given the first hilling, which should be done with the hoe or with the hiller attachment. I prefer the hoe for the first hilling, as, although it takes more time, the earth can be packed more evenly towards the vines than with the machine. The second hilling can be given when the bloom is beginning to show, and should be followed again by the cultivator between the rows. A third hilling, which I call a "side hilling," consists of pulling the earth to one side of the drill, bringing it well up to the vines, and keeping them all on the one side of the hill. This keeps the vines from growing together, and facilitates harvesting.

Of varieties, undoubtedly the best is Yorkshire Hero. Richard Seddon and American Wonder are fairly reliable, and have been giving good results, seeming to stand more frost and rain than other peas. The seed should be covered with about 1 inch or 1½ inches of soil, as peas more often fail to come up well owing to being too deeply covered than because of faulty germination.

DEPARTMENTAL NOTE.—A mixture containing superphosphate and sulphate of potash at the rate of four parts of the former to one of the latter is very suitable for peas. Nitrogenous fertilisers, if used liberally, promote a strong growth of vine at the expense of the pods, and are to be avoided, except when the soil is deficient in nitrogen. They will, however, stimulate weak crops, and might be applied sparingly. Lime is very useful in promoting growth, and can be applied at the rate of 1 ton per acre.

Springside.

A paper was read by Mr. H. Bowen on cereal crops at the last meeting of this branch.

Mr. BOWEN recommended deep cultivation for cereal crops in the district, but urged also that the seed-bed should be solid and well packed, so that the roots of the young plants can take good hold at once. Care should be exercised in the selection of the seed, and he particularly advised that wheats should be chosen that afforded liberal leaf growth for hay purposes. So far nothing had beaten Zealand locally for hay purposes, its main recommendation being that it cured well, did not bleach if stooked properly, and its flag and stem were green right to the ground. Cleveland did not weigh as well as Zealand. Yandilla King had rather fuller grain when cut green, but was a bit short in the straw. Marshall's No. 3 discoloured nastily if rain came, and did not make good chaff. Of oats, Algerian was the best, but Lachlan was likely to compete very closely with it in public favour. Guyra was another good oat, and Sunrise was also promising.

Stratford.

A meeting was held on 14th June, when Mr. J. P. Shedden was elected Chairman in place of Mr. G. Germon, resigned. The meeting discussed the most suitable time and age for mating heifers, and an interesting and instructive time was spent.

The secretary of the branch reports that acting on information obtained from the Department he procured 1 lb. of peanut-seed and planted a small plot for experiment purposes. The season was one of the driest on record, but in spite of that, the yield of nuts was very high. The average was equal to about 200 bushels (of 22 lb.) per acre. The variety was Valencia, and the nuts were much larger than the original seed. The only objection to the crop was the difficulty of harvesting it. Pigs seemed very fond of the nuts, and it was thought that if planted with artichokes, where pigs could have free access to both when ripe, they would prove an excellent fodder.

Tallawang.

The secretary of this branch, reporting on certain varieties of grasses and sorghums supplied by the Department to be sown in October last, stated that he had used the sorghums and Sudan grass as cover crops for the native grasses. Owing to the very dry spring and summer the germination of the native grasses was exceedingly poor and the plots unworthy of record. The sorghums made fair growth, but ran to seed, reaching a height of about 2 feet 9 inches. Sudan grass maintained its reputation as a hardy grower, but in height and stooling it fell far short of previous trials.

A meeting of members was held on 7th June, when a paper was read by Mr. A. Croft on lucerne, of which a summary follows:—

LUCERNE.

After tracing the history of lucerne, Mr. Croft stated that the crop grew luxuriantly not only on the rich alluvial flats of the Hunter River and the neighbourhood of Mudgee, but under the heat of Coonamble, and in Canada it even flourished where it was covered for three months by deep snow. On his own property, notwithstanding the severe drought of the past summer, he had at no time been without a wealth of green feed, and had always had his bins safely filled with hay, which could be brought back almost to the succulence of green feed by the use of the watering can. He advocated the sowing of the seed through a grass-box on an ordinary drill, with the tubes so arranged that the seed would be dropped in even rows on the surface of the soil. The only covering necessary would be provided by fastening bushes under the footboard and allowing them to scratch the surface. He was of opinion that a sowing of 10 lb. per acre would be ample, as even if only 50 per cent. of plants were growing in the second year the stand would be found to be quite thick enough. His experience taught him that there was, at the best of times, little to be gained by the so-called "nurse crop," whereas there was much likelihood of a whole paddock being spoiled by early smothering from tall cereals growing side by side with the tender lucerne plants.

He advocated every farmer laying down a small area before next autumn, and was quite satisfied that all who would do so would lay down 5 acres within two years for every acre sown this year.

DEPARTMENTAL NOTE.—The Chief Inspector remarks that Mr. Croft affords a valuable illustration of the utility of lucerne. It is regrettable that the report was so much abbreviated, for it would have been interesting to have Mr. Croft's views on several points, particularly on the time of sowing. The value of lucerne on higher land is not recognised to the extent that it should be, and this paper is useful in directing attention to this important aspect of the subject.

Thyra-Bunaloo.

On 9th May a meeting of members was held, eleven being present. A discussion took place on ensilage making. Members considered that the best shape for the pit was long and narrow—the width from 15 feet to 18 feet and length not less than 60 feet—depth 6 feet. The pit should be narrower at the bottom than the top. The majority of members considered that 9 feet, the depth recommended in the *Agricultural Gazette,* was too deep, as it would be hard to empty and also hard to cover with earth if filled so that the top of the ensilage would be level with the ground.

DEPARTMENTAL NOTE.—The Chief Inspector states that it has not been found that there is any difficulty in covering with earth, when the material is allowed to settle thoroughly during filling. If the pit must be filled rapidly, shallow pits would probably be more satisfactory. Some pits about 6 feet deep have proved very satisfactory.

A meeting was also held on 14th June, when a discussion took place on rabbit extermination.

It was generally agreed that the high price of skins should assist in the destruction of the rabbit. Mr. Mackintosh stated that in sandy ground, if the burrows were filled with fine sand it would prevent the rabbit from working his way out.

Tingha.

A meeting of members was held in June, when an interesting discussion took place respecting pasture grasses. It was decided to collect and have named specimens when in flower with a view to their further use for the benefit of members.

Toronto.

At the monthly meeting held in June, a paper on subsoiling was read by Mr. J. Froome, who advocated this method of treatment on the grounds that it increased the water-holding capacity of the soil in drought, and in wet seasons it greatly assisted the drainage. In a general way, too, it allowed the roots of plants to penetrate to a greater depth. Various modes of subsoiling were described, Mr. Froome's preference being for subsoiling with the plough. Two ploughs were required for the purpose—the ordinary plough and a subsoiler. The idea was to plough one round about 7 to 8 inches deep, and put a team on the subsoil plough and stir the subsoil in the bottom of the furrow 8 to 12 inches deep.

Windsor.

The first annual reunion of this branch was held on 29th May, when the annual report read by the secretary showed that valuable work had been done during the year, quite a number of meetings being held and well attended. Confidence was expressed that the branch had a useful career before it. The balance-sheet showed that there was a cash balance in hand of £4 11s. 1d., and a later report shows that the reunion resulted in a credit balance of £1 3s. 1d., which can be largely attributed to the activities of the members and secretary.

Yarramalong.

This branch met on 18th June, when a pruning demonstration was conducted by Mr. W. le Gay Brereton, Assistant Fruit Expert. The demonstration was much appreciated by everyone who attended, valuable information being afforded, and many questions answered to the advantage of all.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1919.

Society.	Secretary.	Date.
Parkes P., A., and H. Association	G. W. Seaborn	Aug. 20, 21
Forbes P., A., and H. Association	E. A. Austen	,, 26, 27
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 26, 27, 28
Cootamundra A., P., H., and I. Association	N. Gardner	Sept. 2, 3
Corowa P., A., and H. Society	J. D. Fraser	,, 2, 3
Grenfell P., A., and H. Association	G. Cousins	,, 2, 3
Narandera P. and A. Association	J. Faulkner	,, 9, 10
Albury and Border P., A., and H. Society	F. J. Belbridge	,, 9, 10, 11
Young P. and A. Association	T. A. Tester	,, 9, 10, 11
Northern A. Association (Singleton)	J. T. McMahon	,, 10, 11, 12
Cowra P., A., and H. Association	E. P. Todhunter	,, 16, 17
Culcairn P., A., H., and I. Society	J. B. Ryan	,, 16, 17
Ganmain A. and P. Association	T. S. Henderson	,, 16, 17
Temora P., A., H., and I. Association	A. W. Ness	,, 16, 17, 18
Burrowa P., A., and H. Association	W. Burns	,, 18, 19
Canowindra P., A., and H. Association	H. M. Brown	,, 23, 24
Murrumburrah P., A., and I. Association	W. Worner	,, 23, 24
Wyalong District P., A., H., and I. Association	T. A. Smith	,, 23, 24
Holbrook P., A., and H. Society	J. S. Stewart	,, 30, Oct. 1
Deniliquin P. and A. Society	P. Fagan	Oct. 1
Tocumwal P. and A. Association	A. J. Williams	,, 3
Hay P. and A. Association	C. L. Lincolne	,, 15, 16
Orange A. and P. Association	W. J. I. Nancarrow	,, 15, 16
Bathurst A., H., and P. Association (Spring Show)	S. V. Turrell	,, 29, 30

1920.

Kiama A. Society	G. A. Somerville	Jan. 24, 26.
Ulladulla A. and H. Association (Milton)	R. F. Cork	Feb. 18, 19
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 24, 25, 26
Newcastle A., H., and I. Association	E. J. Dann	,, 25, 26, 27, and 28.
Berrima District A., H., and I. Society	C. E. Wynne	Mar. 4, 5, 6
Armidale and N.E. P., A., and H. Association	A. McArthur	,, 16, 17, 18, and 19.
Camden A., H., and I. Society	A. E. Baldock	,, 18, 19, 20
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 24, 25
Royal Agricultural Society of N.S.W.	H. M. Somer	March 29 to April 7.

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OF

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W. H. BROWN, *Editor.*

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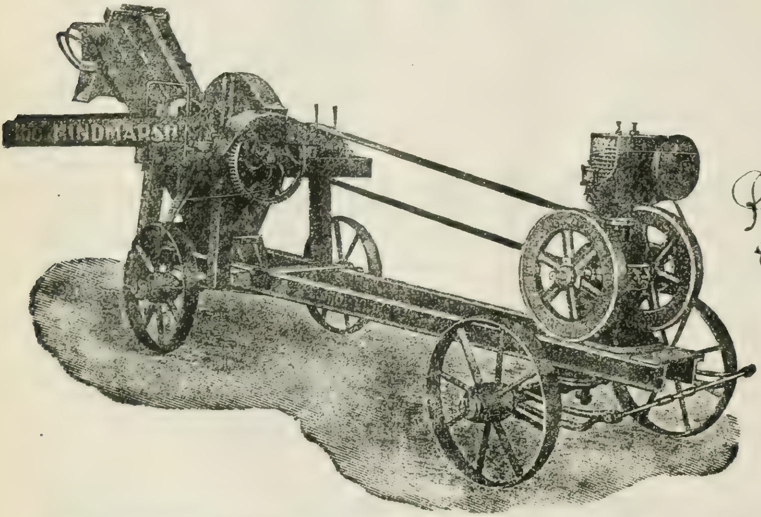

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2nd September, 1919.

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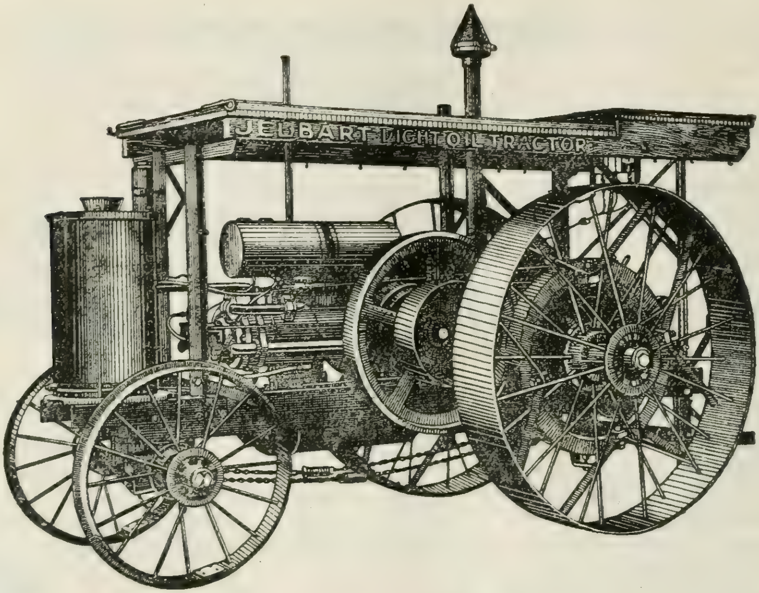

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VOL. XXX. PART 9. SEPTEMBER 2, 1919

Agricultural Gazette of New South Wales.

The Future for Mixed Farming.

A. H. E. McDONALD, Chief Inspector of Agriculture.

OF the war's effects on primary industries, none is more remarkable or important than the enormous decrease in the numbers of live stock in the world. The significance of the decline we are, perhaps, slow to appreciate; but the profits that await the farmer who adapts his farm methods to the increase of his sheep, cattle and pigs are undoubted.

How great has been the loss in this direction may be indicated by summarising figures issued under the authority of the International Institute of Agriculture at Rome, in such a way that the world's live stock population in the year before the war may be compared with that in the year 1917. Perhaps the simplest method of showing the change is to total the increases in all countries that show increases and to set that figure against the total of the decreases in all countries that show decreases. That is the method adopted in the following table, which, however, is incomplete in that the figures were not available for every country at these particular periods, those for Africa, Italy, Argentina, Russia and Germany being unprocurable. The totals available, however, are sufficiently instructive.

	Increases.	Decreases.	Net Increase (+) or Decrease (−).
Horses	1,805,125	2,469,184	(−) 664,059
Cattle	20,614,287	6,721,241	(+) 13,893,046
Sheep	4,746,172	41,056,543	(−) 36,310,371
Pigs	17,841,523	8,055,268	(+) 9,786,255

From these incomplete data, the Canadian Department of Agriculture has endeavoured to estimate the world's figures for live stock, taking as a basis in the cases of certain war-stricken countries the losses experienced in France. The opinion formed was that, leaving out Russia, the world's shortage may be summarised thus:—

World's decrease in Horses	3,468,059
„ „ Sheep	49,516,371
„ „ Pigs	6,254,745
World's increase in Cattle	7,099,046

Statistics with regard to Russia published for the year 1916, show that there was a very great increase in the total number of stock in that country as compared with pre-war days—the result, no doubt, of stock being driven into that country from neighbouring occupied territories in the early days of the struggle. The subsequent invasion of Russia by the Germans, and the generally unsettled conditions of the past two years, have probably accounted for an immense reduction in the more recent totals in that country, so that the estimate of the world position in relation to live stock shown in the above brief table is probably approximately correct.

It is interesting to remark that the effect of the American and Canadian policy of the past few years, " raise all heifer calves," has been to produce an increase in those countries of 15,000,000 cattle in 1918 as compared with 1914, and thus to show a world increase in that class of stock, notwithstanding the heavy losses experienced in Europe.

The World Inclination.

One direct effect of these great reductions in the numbers of live stock will be that when the necessary organisation has been effected, larger areas than ever will be brought under the plough. To restore the numbers of live stock to anything near the normal will take many years, and in the meantime it is reasonable to assume that farmers will find it necessary to utilise their land for the production of crops. In our own case, after great droughts (notably in 1902) we have experienced a very marked activity in farming, for the same reason. In European countries, where the rents are high and where general economic pressure is great, it is highly probable that the revival of farming will be more marked. Burdened by taxation to meet the cost of the war, the people of Europe will naturally endeavour to be self-supporting as far as possible in the matter of foodstuffs, and this will lead to an endeavour to utilise the fields to the utmost. Conversely, it is to be expected that a smaller demand will exist for our foodstuffs, although the organisation and machinery of production must first become stable in those countries which are now in a state of chaos, notably Russia, which in 1912 produced the enormous amount of 800,000,000 bushels.

For a time we shall probably find that our grain is in great demand, but there are certainly reasonable grounds for supposing that this demand will not be so great after a time. The shortage of live stock, on the other hand, will most certainly tend to create a very keen demand for our meat and wool. Owing to the general prosperity during the war, the people of Britain in particular will have become accustomed to a higher standard of living, and the present trend of events indicates that there will be no reversion to pre-war standards. The men in the fighting ranks received regular rations of meats, and habits have been formed which will continue in civilian life. The reduction in the numbers of sheep means a decrease in the quantity of wool available and a corresponding demand for our clips.

The Problem of Adaptation.

Altogether, it appears that for a very considerable time the products of live stock will command such high prices as to make a radical change in our farming methods quite imperative. The problem that has to be solved is how and to what extent, if any, such a change can be made. Habits once formed are hard to change, and very many farmers seem to have formed " a wheat-growing habit," and are loth to break it.

It is probable that this is largely due to the fact that it is still popularly considered that natural pastures and large areas are essential to profitable sheep-raising. In the early days of wheat-growing, very profitable crops were obtained, and in consequence wheat-growing farms gradually became reduced in size, until to-day the average is between 400 and 600 acres. The idea that sheep should be grazed principally on the grasses still seems to prevail to a large extent, and the average farm is considered too small to carry many sheep. In recent years wheat-growing has not been so profitable as formerly. The seasons have, perhaps, not been so favourable, but probably the main reason is that the soil is not now so suitable for the production of high yields.

At the time wheat-growing was first commenced on an extensive scale much of the land of the State was practically in its virgin state, great areas not having been even ringbarked. For centuries the surface of the land had been enriched by the leaves and bark that fell from the trees; and when the timber was cleared off in front of the ploughs the soil was full of humus, which rendered it not only fertile, but also in a condition in which it would readily absorb and retain moisture for long periods. The destruction of the timber not only deprived the soil of its source of supply of vegetable matter, but it also exposed the surface to heat and drying winds, in itself very destructive to the humus. The practice of constant (if not continuous) cropping and burning of the stubble has hastened the oxidation of the humus and has caused an enormous increase of weeds, and the spread of diseases like take-all.

Strange as it may seem, even the "new land" that is broken up to-day is often not "new land" in the same sense as that of twenty or thirty years ago. In the early days of wheat-growing, land was cleared of the green timber and ploughed at once; but to-day the "new land" has often been "rung" five, ten or twenty years before, so that the surface has been deprived of the falling leaves and bark and has been exposed to the sun and the wind for almost the whole of the time. Such land cannot, in the very nature of things, be in the friable fertile condition of land that has been cleared of timber and turned to wheat at once. Here lies the explanation of the complaint often heard, that "even new land does not yield as well to-day as new land did years ago." It is not that our soil is on the point of exhaustion, nor altogether due to the seasons being drier. It is largely because methods have been adopted that spoil the physical condition of the soil, make it break up in a hard cement-like state, and rob it of power to absorb and retain moisture.

The value of humus as a fertilising agent is not generally understood—not even among farmers who are fairly well acquainted with the usefulness of fertilisers. As a matter of fact, it is really the most valuable of all soil constituents, and particularly so in dry areas. In European countries the humus content has been maintained for centuries by frequent applications of farmyard manure; and farmers have found it a profitable practice to keep stock on their farms, and even to feed concentrated feeds such as oilcakes, almost solely with a view to the value of the manure, and with the knowledge that direct profit from the animals themselves would often be very slight. Our farming has not yet become so intensive as to warrant this course, but it has reached a stage at which it is necessary that some other method shall be found by which the fertility of the soil shall at least be maintained and, if possible, increased. The system of continuous cropping for grain, even the alternation of grain and bare fallow, is inherently unsound, and is rapidly leading to a condition of things in which farming on the present lines will become altogether unprofitable.

Stock Combined with Grain.

As we look around for a sounder method of farming we cannot but be arrested by the method by which older lands have maintained the fertility of their soils for centuries. We must make up our minds to carry live-stock to a much greater extent in combination with grain-growing. The stock must, of course, be valued as a direct source of income; but they must also be regarded as a means of enriching the soil and so rendering possible higher yields of grain.

It is an essential of this method, however, that the stock should not be expected to subsist only on the natural grasses, even when supplemented by such pickings as stubble and weed growth. These can certainly be turned to profit, but so long as they are regarded as the main food supply, live stock will not be of much importance on the wheat farm. Most wheat farms are poorly grassed; indeed, it is common knowledge that, with certain limitations, the best grazing land is unsuitable for wheat-growing while the most valuable land for grain production is not by any means the best grazing land. This, however, applies principally when the natural growth is relied upon for grazing. When prices of stock were low it probably was not possible to grow crops profitably for sheep feed, but at present values the practice should give a very handsome return provided suitable sheep are kept.

One very important advantage possessed by the farmer who keeps live stock, over the one who depends principally upon his grain crops, is the greater certainty of steady returns. The success of the wheat crop depends very largely upon whether rain falls at the right time of the year. Should the weather continue unsatisfactory up to a certain point, the most favourable weather subsequently will be of no value. Stock, however, are not so dependent upon rain falling within prescribed limits, and can subsist for a long time without it. Moreover, the farmer who keeps sheep can turn to profitable account a crop that is failing for want of rain by simply turning the sheep in to feed it off.

The Farm's Capacity for Sheep.

The number of sheep that can be carried upon a farm depends, of course, upon the climate, and to a lesser extent upon the soil. In the north-western districts, where there is normally a good summer rainfall, fair growths of such crops as maize are obtained, while winter crops also thrive, and the carrying capacity of the farm per acre can be made fairly large. In the central western slopes and in the Eastern Riverina the carrying capacity should be also high. Farms on the central western plains and on the outer fringe of the wheat-growing belt in the Riverina should be able to carry many more sheep than are run at present.

It is essential to profitable results that farmers should renounce the idea that sheep must be pastured principally on grass. It is imperative, too, that a good class of breeding ewes should be obtained and a certain type should be rigorously bred. Unfortunately, very many farmers have extremely inferior sheep, which is remarkable, seeing that the same farmers usually know the value of growing only suitable varieties of wheat. Inferior sheep generally produce fleeces of about half the value of those from good sheep, and also raise lambs that are worth considerably less than those from good ewes. Good sheep require only the same amount of feed as poor sheep, and return a profit where the others may not even pay for their keep.

In providing feed for the sheep, consideration must necessarily be given to local circumstances. On some farms an abundant growth of natural herbage occurs at certain periods of the year and provides ample feed, as for instance, where crowfoot, trefoil or barley grass grow vigorously. At such times, fodder crops would obviously not be required. As a matter of fact, such herbage is often so abundant that it cannot be utilised. The carrying capacity of land of this class is limited by the amount of feed available at other seasons of the year; but by providing crops or silage against periods of shortage, sufficient stock can be carried to make profitable use of the abundant growth that would otherwise be wasted.

Crops Suitable for Feeding Off.

It should be remembered that cultivated crops make more rapid growth than natural grasses or herbage, and even when a good growth of herbage may be anticipated the sowing of a crop to provide feed quickly is warranted and even necessary. Such crops are particularly valuable in autumn, especially if the ewes are lambing, as they generally provide feed long before the natural herbage is ready for use. Crops such as wheat, oats or barley provide excellent grazing for sheep. When grown for this purpose, late maturing varieties sown earlier than is usual with crops intended for grain will be found to produce more feed during autumn, winter and spring than any other crop. Such crops should be sown much thicker than for grain, and a bushel or more seed can be profitably used. The thick seeding produces a heavy yield of finer and more palatable stems. A short, thick growth is of higher feeding value than long, coarse stems. Most farmers have observed that the stubble of a well-grown crop is never so readily eaten by stock as that from a poor crop. Feed can be provided for the early autumn by sowing the cereals mentioned towards the end of February or early in March. Early maturing varieties sown at this time quickly produce a heavy growth, but do not provide feed over as long a period as late varieties. Larger areas can be sown at the end of March and during April to provide grazing in the winter, and if necessary in the spring, and even up till about the end of November or later. These crops will by no means be wasted should there be a plentiful growth of natural herbage early in the winter, for the very conditions that bring along the herbage will make profitable grain or silage crops of the cereals. In many districts, feeds for the summer may be secured by sowing maize, Sudan grass or the grain sorghums. Experiments with the two latter have been conducted by the Department in recent years, and have proved them to be very drought-resistant, and during the present year farmers who have had plots of them in the western districts found they afforded valuable feed when there was none elsewhere.

In many districts maize will produce a good bulk of green feed, especially if suitable varieties are selected and the sowings are made early in the summer. In any case the wheat stubbles are available during the summer, and by providing proper licks and allowing a ration of silage the sheep can be carried safely.

Even with the best of management, however, crops will fail at some period, and provision should be made against such shortages by conserving forage. For this purpose silage is of greater value than any other form of feed. More of the natural juices are retained in it than in any other form of feed, and it is consequently more suitable for feeding than hay. Evidence in regard to its suitability for lambing ewes is to a certain extent contradictory; but our own experience is that it is of higher value for feeding at this time than any other conserved feed, and that even when grasses are altogether absent, ewes will lamb satisfactorily on it provided they are handled carefully. It possesses other advantages over hay, particularly in regard to cheapness of production, absolute safety against fire, storms and pests.

A Workable Method.

The modifications in the farming methods which will be necessary to combine sheep to a greater extent with grain-growing will depend upon local circumstances. On a farm of about 500 acres of ordinary wheat-growing country, where 300 acres are generally cropped and where the rainfall is fairly good, the following method should be workable.

Each year 150 acres could be sown with wheat for a crop of grain. Of the remaining 150 acres, which had grown wheat the previous year, a first 50 acres could be disced or ploughed in January or February and sown with wheat, oats or barley to provide a quick growth of green feed, and after the crop had been well grazed down, the area could be ploughed for fallowing about August. A second 50 acres might be worked later, and the same kind of crops sown in April, which would provide grazing or silage, according to circumstances; this land could be broken up at any time after the crop was taken off in preparation for sowing for grain the following year. The third area of 50 acres might be ploughed about July for sowing with maize, or other crops for summer feed, or if the district was unsuitable for these, for fallowing for the next grain crop. If the summer crops were drilled and a little cultivation given, the land would be in good condition for the next sowing. As a matter of fact, good farmers in some districts claim that such land produces better crops of wheat than does fallowed land. It is presumed that on such a farm about 200 acres would be in grass, suitable for grazing. While the area under grain would be reduced, the loss on that score would be balanced to a certain extent by higher yields. Further, the amount of labour would be materially reduced, as although the total area ploughed each year would be practically the same (some part of the area having to be ploughed twice), the work would be distributed over a longer period, and the labour in harvesting would be much less.

Such a system of farming might be expected to result in the average yield of grain in the State (12 bushels per acre) being increased to 15 bushels, and 150 acres would thus return about £300, after allowing for seed. It could be reasonably assumed that at least 350 breeding ewes could be carried (often a much larger number), and a lambing of 80 per cent., which should easily be obtained, would represent (at 15s. per lamb) £150, the wool clip easily netting £125. The total from the sheep would thus be £275, and from the whole property (wheat and sheep combined) £575.

Used as a grain farm only, such a property would carry few sheep. The gross return from the wheat (taking an average of 12 bushels at 3s. 6d. per bushel) would be about £600, after allowing for seed. This is slightly more than from the combined wheat and sheep venture, but a greater expenditure of labour and of stores would be required, and the farmer would be much less certain of a steady return, owing to his greater dependence upon the weather. The farmer who carries stock is not so liable to loss in this way, and in poor seasons can turn his crops to good account by grazing them off.

THE PROSPECTS FOR LIQUORICE GROWING.

THE high prices that have ruled for liquorice during the war have prompted inquiries whether it can be grown locally to advantage. The interest in the subject was enhanced some time ago, too, by the announcement that a quantity that had been grown at Bathurst Experiment Farm had been disposed of at 1s. 6d. per lb., a price that, on the crop obtained, would represent a return of about £240 per acre. Further inquiries elicited the fact, however, that the quantity of liquorice root used in New South Wales is apparently about 1 ton per annum, and that the 1s. 6d. per lb. was quite a "war price," and not a fair criterion of what might be obtainable under normal conditions. In addition to the 1 ton of crude root, some 50 to 75 tons of "root juice" (the concentrated liquorice of commerce) is annually imported into New South Wales, and for this manufactured product, the best of which comes from Spain, the price runs from 7d. to 1s. 6d. per lb., the last being the figure ruling under war conditions. What it would cost under Australian conditions to produce the "root juice" from the crude root it was impossible to ascertain.

The Manager of Bathurst Experiment Farm, replying to a question whether he would recommend the crop to farmers, said he would not, as it is difficult to eradicate from soil in which it has once been grown. Arrangements are being made, however, for further trials at Bathurst.—A. H. E. McDONALD, Chief Inspector of Agriculture.

TO PREVENT CROSS-FERTILISATION OF MAIZE.

NUMEROUS inquiries are being addressed to the Department by farmers as to how they can prevent varieties of maize from becoming cross-fertilised. These growers are doubtless desirous of keeping pure the strains they are purchasing from the Department and elsewhere, and the question is, therefore, of considerable interest.

Observations have shown that cross-fertilisation depends more upon the direction and force of the wind during tasselling than any other factor. At least a quarter of a mile should separate two varieties sown about the same time, if they are to be kept pure. Should this be impossible, half the distance may suffice if a tall crop of maize or sorghum lies between. Where the conditions allow of a long planting season, two varieties may be kept pure by allowing at least three or four weeks between the dates of planting or germination. In this case the plots can be adjacent.

Very little success has attended the method of planting an early and a late variety together to get pure seed of each. It is usually found that the flowering period extends over two or three weeks, and the late flowering of the early variety and the early flowering plants of the late variety overlap a few days—sufficient to cause quite noticeable crossing. White-grained varieties crossed by yellow ones show a trace of the yellow the same year as interpollination takes place, and the size of the grain is increased by crossing with a variety of larger grain.—H. WENHOLZ, Inspector of Agriculture.

EXPENDITURE ON SCIENTIFIC AGRICULTURE IN ENGLAND.

THE expenditure of the British Government on scientific and organised agriculture in England shows an instructive increase in recent years. The following are the amounts expended by the Board of Agriculture in England in the years named, as given in the *Journal of the Board of Agriculture* in April:—

	£
1913-14	264,312
1914-15	318,885
1915-16	367,752
1916-17	384,167
1917-18	462,947
1918-19	502,270

The last amount was estimated near the end of the financial year.

"LARGE GREEN" BANANAS.

THERE are many varieties of native-grown bananas, which could be defined as "large green," growing throughout the north-west islands of the Pacific. A number of these, collected from different islands, have been tried in Australia, but in no case has the fruit warranted the introduction of the variety to the Commonwealth. The flavour of the best of them is very inferior to that of the Cavendish bananas.—R. A. HOPKINS, Orchardist, Grafton Experiment Farm.

Farmers' Experiment Plots.

SUDAN GRASS EXPERIMENTS, 1918-19.

Murrumbidgee Irrigation Area.

G. G. ST. CLAIR POTTS, H.D.A., H.D.D., Assistant Inspector of Agriculture.

MANURIAL trials with Sudan grass were conducted during the past season in co-operation with the following settlers:—

E. J. Polkinghorne, Farm 728, Leeton.
Ross-Reid Brothers, Farm 178, Leeton.
J. Sippel, Farm 138, Leeton.
A. H. McDonald, Farm 151, Leeton.
K. C. Miller, Farm 187, Leeton.
H. Black, Farm 53, Leeton.
S. M. Alexander, Farm 162, Leeton.
W. Evans, Farm 139, Leeton.
A. G. Marshall, Farm 732, Leeton.
Houghton Brothers, Farm 918, Leeton.

Comparative yields were not obtainable at the last three mentioned centres owing to infestation of lucerne, damage caused by wood ducks, and weak germination respectively. The experiments have emphasised the value of Sudan grass as a summer fodder, and also the necessity of applying artificial fertilisers to obtain maximum yields. Although this grass has been grown on the Yanco Experiment Farm for the past five years, its utility had never been fully recognised by settlers, owing, no doubt, to the comparatively wet seasons experienced during 1916 and 1917. However, keen interest was taken in the yields from Sudan grass, and it is anticipated that in the future large areas will be devoted to the culture of this crop.

Most of the trials were conducted with the object of determining the most suitable fertiliser for this grass, and the results have demonstrated clearly that 1 to 2 cwt. of superphosphate or the mixture P7 (equal parts of bonedust and superphosphate) can be used with much profit. Artificial fertilisers increase flag growth, stooling propensities, height of stalks and yield. The difference in height was not so marked at some centres, the increased stooling of the grass when manured accounting for the higher yields. The mixture known as P8 (equal parts of superphosphate and blood and bone) made no appreciable difference to the growth.

The Season.

The season was one of the most trying on record. Frosts were registered during the first week in October, and cold nights prevailed until the middle of November. These conditions were responsible for comparatively slow growth during the early part of the season. Incessant hot, strong winds continued until February, necessitating constant irrigation. The grass continued to grow until the advent of heavy frosts in mid-June.

The rainfall during the growing period was of little value, as the following figures indicate:—October, 74 points; November, 7 points; December, 31 points; January, 13 points; February, 80 points; March, 72 points; April, 13 points; May, 163 points; total, 571 points.

The Plots.

Farm 728.—At this centre Hungarian millet was compared with Sudan grass, and a manurial trial was also conducted; red clay soil.

Sowing operations were carried out on 15th October, with seed of Sudan grass at 4 lb. and millet 6 lb. per acre. The rows in each case were sown 3 feet apart, allowing of furrow irrigation and inter-row cultivation. The germination at first was patchy, but a good strike followed irrigation, and the grass demonstrated its quick-growing qualities, producing 3 tons of green fodder per acre after twelve and a half weeks' growth, and standing 5 feet in height. At this period the millet was only 2 feet high, and when harvested seventeen weeks after planting it stood 4½ feet in height, whereas the second growth of Sudan grass had attained a height of 5 feet in five weeks, with marked stooling qualities, as many as 213 stems per plant being counted. Certainly the first growth of millet produced 5 tons of green fodder per acre, an increase of 2 tons over the Sudan grass, but the latter continued to grow, producing two more yields and totalling 11¾ tons per acre for the season, whilst the second growth of millet was represented by a few solitary plants not worth harvesting. Superphosphate increased the yield of the grass considerably, but its effect on the millet was negative. The horses on this farm were fed on Sudan grass hay during the summer months and retained their condition throughout. They preferred it to the millet hay.

Previous crop, Japanese millet, 1914; ploughed April, 1918, and fallowed during the winter; irrigated, 7th October; cultivated, 11th October; tine-harrowed after sowing on 15th October. Prior to first cutting irrigated on 19th November, 1st, 16th, 29th December; cultivated four times; between first and second cutting, irrigated on 19th, 28th January, 11th February; cultivated once between second and third cutting; irrigated on 15th March.

Variety and Manure per Acre.	Acre Yield. First cut.				Acre Yield. Second cut—6 weeks.				Acre Yield. Third cut.—10 weeks.				Total Acre Yield.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Green Fodder—																
Sudan Grass—																
No manure (*check*)	3	0	1	12	4	8	2	8	2	15	0	0	10	3	3	20
1 cwt. Superphosphate	3	2	0	16	5	6	1	20	3	7	0	16	11	15	2	24
Hungarian Millet—																
1 cwt. Superphosphate	4	7	2	0	....				....				4	7	2	0
No manure (*check*)	5	0	2	24	....				....				5	0	2	24
Hay—																
Sudan Grass—																
No manure (*check*)	1	7	3	12	1	11	0	8	1	8	2	8	4	7	2	0
1 cwt. Superphosphate	1	7	3	12	2	0	2	24	1	10	0	0	4	18	2	8
Hungarian Millet—																
1 cwt. Superphosphate	2	9	1	4	....				....				2	9	1	4
No manure (*check*)	2	10	2	24	....				....				2	10	2	24

Percentage of hay to green fodder—Sudan grass, 43·24 per cent.; Millet, 53 per cent.

Farm 178.—The experiment was sown on 16th October on red, light textured clay loam, the rows being 3 feet apart, and sowing at 4 lb. per acre. The effect of manure was not so marked on this farm, but the paddock had previously grown lucerne, which had been stocked frequently with sheep—a decided factor in maintaining fertility. Yields of the first growth only were taken for comparative purposes, the two subsequent growths being grazed with sheep to determine the carrying capacity, palatability and feeding value. After occupying the ground for eleven weeks the crop averaged 4½ feet in height and yielded up to 2 tons 17 cwt. of green fodder per acre.

From 2nd to 11th January 150 lambs were carried on 1¾ acres of Sudan grass and ¾ acre *Phalaris bulbosa* for ten days, and notwithstanding the height of the Sudan grass, only a few stalks remained at the end of the feeding period, an excellent illustration of its palatability. The lambs were topped off for the Sydney market and realised comparatively high prices.

Six weeks after this, 152 sheep were carried for eleven days from 22nd February to 7th March on the same area. The grass averaged 4½ feet in height, with ears just peeping. A third grazing was effected five weeks later the same area carrying 150 lambs for four days from 12th to 15th April. The grass averaged 2 feet high, a stage most suitable for grazing purposes. The *Phalaris bulbosa* was of no value for the last two grazings.

Previous crop, field peas, 1917; ploughed May, 1918; ploughed, September; irrigated, 7th October; cultivated, 15th October; tine-harrowed after sowing on 16th October. Prior to first cutting, furrow irrigated 13th and 23rd December; cultivated, 17th, 27th December; between first and second growths, furrow irrigated 15th, 31st January, 16th February; cultivated, 20th January; between second and third growths, furrow irrigated 25th March.

Manure per acre.	Acre Yield.			
	t.	c.	q.	lb.
No manure (*check*)	2	14	3	24
1 cwt. Superphosphate	2	9	3	17
½ cwt. ,, ...	2	17	0	15
No manure (*check*)	2	7	0	1

Farm 138.—This experiment was sown on 24th October in rows 2½ feet apart, and at the rate of 5 lb. seed per acre. The soil, a red clay loam, had been cropped for two seasons previously with saccharine sorghum. As anticipated, the fertilisers were most effective, the P7 plot accounting for an increased yield of 2 tons 8 cwt. of green fodder above the unmanured check plot. Germination was excellent, and the manured sections showed up to advantage early in the season. The effects of the P7 mixture were most permanent, the plot being marked throughout the season by vigorous flag growth, a dark-green colour, succulence and stooling qualities, whilst in the last growth the plot manured with superphosphate differed only to a slight degree from the unmanured sections.

The first growth was harvested for hay, but the subsequent stands were utilised for grazing cattle. Eight weeks after the first growth had been harvested, eighteen head of milking cows were grazed for nine hours daily for eleven days, 6th to 16th March, on 2½ acres. A second grazing followed after six weeks' growth, when the same number of cows were carried for seven hours daily for five days, from the 7th to 11th May. The grass averaged 4½ to 5 feet in height at each grazing period. A decided increase in the milk flow and butter production was noted after feeding on the grass, the cows having been removed from lucerne. When again fed with green maize the yields dropped considerably. The cattle at this centre preferred Sudan grass to lucerne, for when placed in a paddock containing both these crops, they remained on the grass for three days, neglecting the lucerne entirely until the former was eaten out. In fact, they returned to the grass periodically, keeping it closely grazed and refusing isolated lucerne plants growing amongst the grass. This experience shows clearly the palatability of Sudan grass, and also stresses the importance of changing the ration to stimulate milk flow. It is not intended by any means to depreciate the value of lucerne as a fodder.

Prior to sowing, ploughed in August and disc-harrowed; irrigated, October; ploughed, tine-harrowed before and after sowing on 24th October. Prior to first cutting, furrow irrigated on 8th, 22nd December; cultivated on 12th December; between first and second growths, irrigated 19th January, 3rd, 18th February, 1st March; cultivated, 24th January, 8th February; between second and third growths, irrigated 20th March.

Manure per acre.	Acre Yield. First growth—10 weeks 5 days.				Acre Yield. Second growth—7 weeks 5 days.				Total Acre Yield.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
No manure (*check*)	1	4	1	4	2	2	0	16	3	6	1	20
cwt. Superphosphate	2	1	3	4	2	6	1	20	4	8	0	24
2 cwt. ,, ...	2	4	2	16	2	5	2	24	4	10	1	12
2 cwt. P7	2	12	0	16	3	10	2	24	6	2	3	12
No manure (*check*)	1	11	1	20	2	2	0	16	3	13	2	8

The weights of the third growth were not obtained, but it was estimated to average 1½ tons of green fodder per acre.

Farm 151.—The experiment was sown on 25th October, the seed being drilled at the rate of 6 lb. per acre in rows 3 feet apart. The germination was extremely thin, and flood-irrigation was practised to effect a satisfactory strike on the Boree (crab-holey) soil. Owing to the uneven growth caused by different germinating periods, comparative weights from the first cut were not obtainable. The manures made little difference throughout the season.

The carrying capacity of this grass was tested twice during the growing period as follows:—From 18th to 25th January, after twelve weeks' growth, with the grass standing 4 feet high, twenty-seven head of milking cows were grazed six hours daily for seven days on 2 acres. Seven weeks later twenty-eight cows were grazed three hours daily for fourteen days from 26th March to 8th April on the same area, the grass averaging 4½ feet high. A comparison of Sudan grass with paspalum as a milk producer was made at this farm, and is reported in another article in this issue.

Previous crop, Japanese millet, 1917; disc-ploughed and cultivated twice in September, 1918; irrigated and disc-cultivated twice in October; tine-harrowed after sowing on 25th October. Flood-irrigation was practised during growth on 16th, 30th November, 15th, 29th December, 14th January, 1st February, 3rd, 29th March.

The second growth was cut after a period of six and a half weeks from the first grazing, with the following results:—

Manure per acre.	Acre Yield.			
	t.	c.	q.	lb.
No manure (*check*)	2	8	2	8
1½ cwt. Superphosphate	3	1	0	8
1½ cwt. P8	3	0	0	0
No manure (*check*)	2	11	3	4

Farm 187.—The experiment was sown 30th October on red clay loam soil, at the rate of 10 lb. per acre, in rows 21 inches apart. An excellent germination followed and early growth favoured the manures, especially superphosphate and P7 mixture. The plot treated with P8 mixture was backward, the grass not responding till the second growth. Superphosphate returned a substantial increase over the unmanured sections, and P7 also was used profitably. The second growth was harvested somewhat late, causing decreased yield for the third cut. Those plots manured with superphosphate and P7 grew grass averaging 5 feet in height, whilst the unmanured sections were only 4 to 4½ feet high. After each cutting, stock were grazed on the stubble, which provided excellent picking for a few days.

Previous crop, wheat in 1917; ploughed in September, 1918; irrigated on 19th October; disc-harrowed on 29th October; check banks erected 1 chain apart; tine-harrowed before and after sowing on 30th October. Prior to first growth, flood-irrigated on 21st November, 4th, 19th December, 3rd January; between first and second growths, irrigated 19th January, 3rd, 18th February; between second and third growths, irrigated on 20th March, 3rd April; cross-cultivated, 25th March.

Manure per acre.	Acre Yield. First cut—10 weeks.				Acre Yield. Second cut—5½ weeks.				Acre Yield. Third cut—11½ weeks.				Total Acre Yield. 27 weeks' growth.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
No manure (*check*)	2	12	0	16	2	2	0	16	0	14	2	16	5	8	3	20
1 cwt. Superphosphate	3	10	2	24	3	3	3	20	1	1	3	4	7	16	1	20
1 cwt. P7	3	14	1	4	2	15	0	0	1	4	1	4	7	13	2	8
1 cwt. P8	2	8	3	20	2	12	0	16	0	18	2	8	5	19	2	16
No manure (*check*)..	2	12	0	16	1	19	1	4	1	0	2	24	5	12	0	16

Farm 53.—Sowing operations were conducted on 8th November, the soil being grey crab-holey. A maize dropper was employed, sowing at the rate of 4 lb. per acre in rows 3 feet apart. A good germination was obtained, but wood ducks thinned out the crop considerably, and on this account it was fed off. The two subsequent cuts were weighed, and in each instance the application of 2 cwt. superphosphate resulted in a slightly increased yield. The effect of manures on this crab-holey country, however, was not so marked as on other classes of soil. Isolated plants of Sudan grass were cut seven times during the season, when about 2 feet in height. The stooling qualities were most pronounced, also fine stems and abundance of flag. This appears to be the best stage for grazing, and as the analysis shows, it possesses the highest feeding value.

Previous crop, field peas harvested for grain in October; irrigated on 4th November; ploughed, 6th November; tine-harrowed before and after sowing on 8th November. The crop was irrigated in furrows seven times and cultivated three times during growth.

Manure per Acre.	Acre Yield. Second growth—5½ weeks.				Acre Yield. Third growth—10½ weeks.				Total Acre Yield. 16 weeks' growth.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
No manure (*check*)	4	0	2	24	2	5	1	12	6	6	0	8
1 cwt. Superphosphate	3	16	1	20	2	5	2	24	6	2	0	16
2 ,, ,, ...	4	1	0	8	2	8	2	8	6	9	2	16
No manure (*check*)	3	1	3	4	2	4	1	4	5	6	0	8

Farm 162.—The experiment at this centre was outlined as a rate of seeding and manurial trial. Sowing operations were conducted 11th and 12th November on red clay loam, in rows 14 to 21 inches apart, at the rate of 16 and 10 lb. per acre respectively. The land was irrigated and ploughed in October, the grass being sown in a dry seed-bed. Check banks ½ chain apart were erected, and after flood-irrigation an excellent germination resulted. The land was tine-harrowed immediately after irrigation. A small area left untreated germinated very badly with subsequent weak growth, illustrating the value of harrowing to break a surface crust. The value of fallowing was demonstrated clearly on the headlands of this plot. These were ploughed in March and the remaining section in October. The increased growth was most marked on the fallowed land. Manures were beneficial, with 1 cwt. superphosphate returning the highest yield, but the differences noted in the rate-of-seeding test were small.

The first growth was harvested with the reaper and binder eleven weeks after sowing, and the stubble carried 315 sheep, two cattle, and six horses for eight days continuously from 11th to 21st February on 10 acres. The stock were removed for irrigation when the grass was sufficient to have carried them for a fortnight. During the middle of March the grass was slightly cut with frost and the growth checked by cold nights. The second growth, six weeks after the stock had been removed, averaged 3 feet in height, and the same area was then grazed with 420 sheep and five foals from 5th to 26th April, a period of three weeks. The Sudan grass hay was chaffed, producing an excellent sample relished by horses.

Previous crop, wheat, 1916; self-sown wheat crop, 1917, eaten off by sheep; irrigated, October, 1918; ploughed, graded, checked, cultivated twice with tandem disc harrow; tine-harrowed before and after sowing on 11th and 12th November; flood-irrigated on 14th November, 12th December, 15th January, 24th February, 21st March, 5th April; cross-cultivated, 4th March.

Manure per Acre.	Rate-of-Seeding per Acre.	Acre Yield—Green Fodder.				Acre Yield—Hay.				Percentage of Hay to Green Fodder.
	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	
No manure (*check*)	16	1	17	0	16	0	16	1	20	44·23
½ cwt. Superphosphate	16	1	17	3	12	0	15	2	24	41·51
1 ,, ,, ...	16	2	17	0	16	1	6	1	20	46·25
2 ,, ,, ...	16	2	2	3	12	1	0	0	0	46·66
2 ,, ,, ...	10	2	0	0	0	0	17	3	12	44·64
1 ,, ,, ...	10	2	6	1	20	0	19	1	4	41·54
½ ,, ,, ...	10	2	2	3	12	1	0	0	0	46·66
No manure (*check*)	10	1	17	0	16	0	16	1	20	44·23

Cultural Details.

The following suggestions may assist settlers in the cultivation of Sudan grass under irrigation.

The sowing season extends from October to January. The seed can be sown through a wheat drill, using the gears for sowing the lowest quantity of wheat. When sown in rows 3 feet apart approximately 4 lb. seed per acre will run through, the proportion increasing according to the number of hoppers used. If broadcasted, 12 to 15 lb. seed per acre is required.

Sudan grass will thrive well with abundance of moisture when established, but the young plants are susceptible to scalding, and care must be exercised with irrigation during the early stages of growth. The land should be irrigated prior to sowing, as no reliance can be placed on natural precipitation to effect a satisfactory germination, and the practice of sowing in a dry seed-bed and flood-irrigating afterwards is not advocated, owing to the weak germination that usually results. The depth of sowing should not be more than 1 to 2 inches.

When harvesting, the grass should be cut in the flowering stages, viz., on the appearance of anthers containing pollen. The maximum yield is then obtained, succulence is assured, and the feeding value is higher. If allowed to remain any longer, the following growth is retarded considerably and the yields are lowered. The time at which the grass reaches 2 feet high is considered the best for grazing; if sown early it can then be fed off seven to eight times during the growing period. The average growing period for each cut of green fodder up to the flowering stages is ten to twelve weeks for the first growth, six weeks for the second growth, and ten to twelve weeks for the third.

The performances of Sudan grass on all classes of soil during the past season were highly satisfactory, its ability to produce heavy yields in a short period, together with high feeding value, palatability, succulence and carrying capacity marking it as an ideal summer fodder for settlers engaged in any class of stock-raising. In fact, orchardists with a few horses and a cow or two are well advised to grow a small area of this grass to ensure succulent fodder or a good class of hay when pastures are scarce.

IRRIGATION AS APPLIED TO POTATOES.

A TAMWORTH correspondent sought information from the Department recently on the subject of irrigating potatoes, asking to what extent the crop is suited to that method of production.

The Department replied that potatoes are difficult to grow under irrigation in a warm climate, and that considerable experience is necessary before the best results are obtained. The crop usually produces few tubers and second growth occurs very often. By sowing suitable varieties such as Up-to-date, and thoroughly watering the land before planting, and by frequent cultivation during growth, using just sufficient water to keep the crop growing evenly, good yields are obtainable. Free, well-drained soil should be selected.

A USEFUL COMBINED SPRAY.

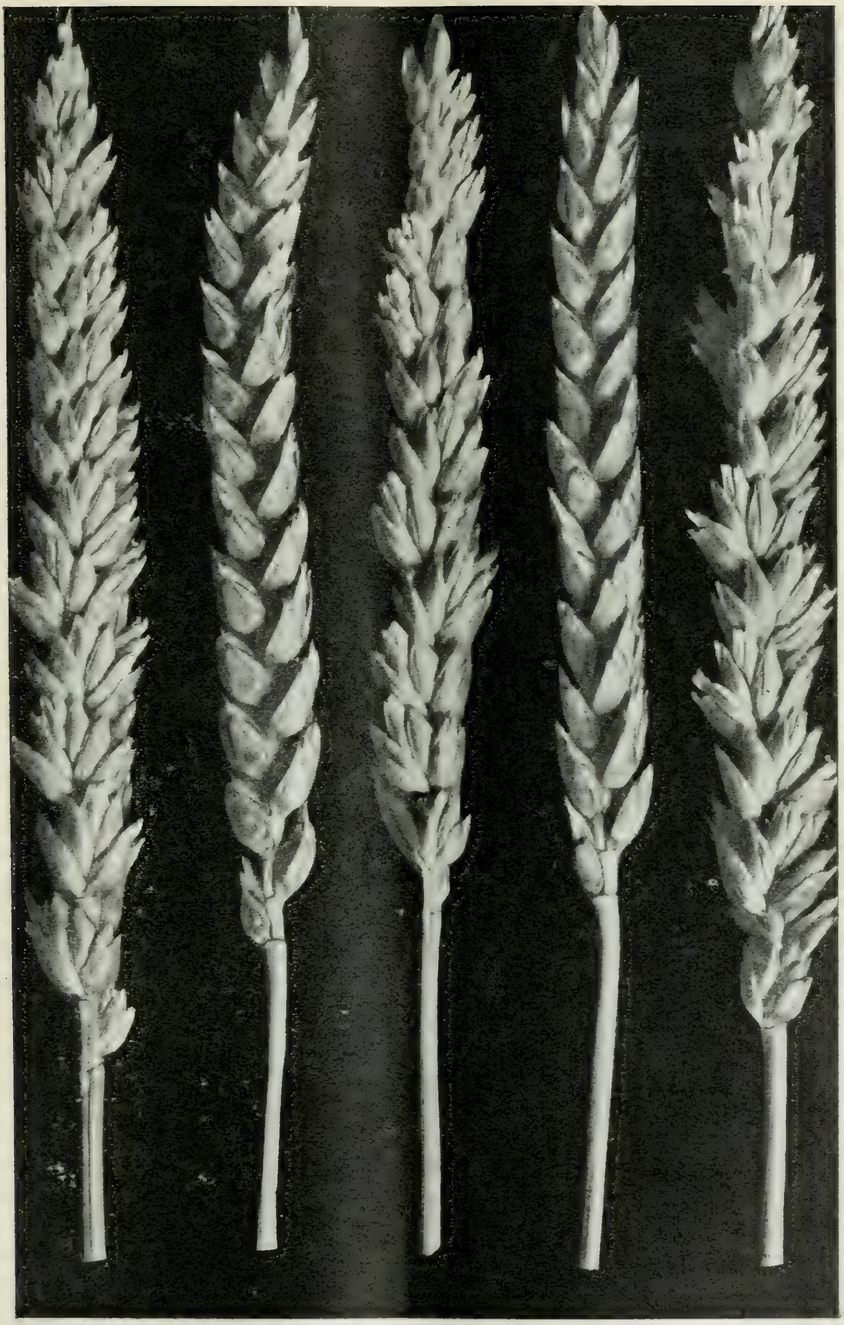
REPORTING on some experiments with various arsenates for the control of codlin moth in the orchard at Bathurst Experiment Farm, the orchardist, Mr. G. A. Meir, remarked that in a hot and dry season like last summer it is important that something should be added to the lead arsenate solution to ensure it being spread evenly over the surface of the apples.

Seeing that none of the lead arsenate was checking the codlin moth last season, and that flour paste was not spreading the lead so evenly over the fruit as to check the moth, the officer in question decided to experiment with soft soap. He therefore used a solution made up as follows:—

Soft soap	8 lb.
Tobacco extract	½ pint.
Lead arsenate	4 lb.
Water	80 gallons.

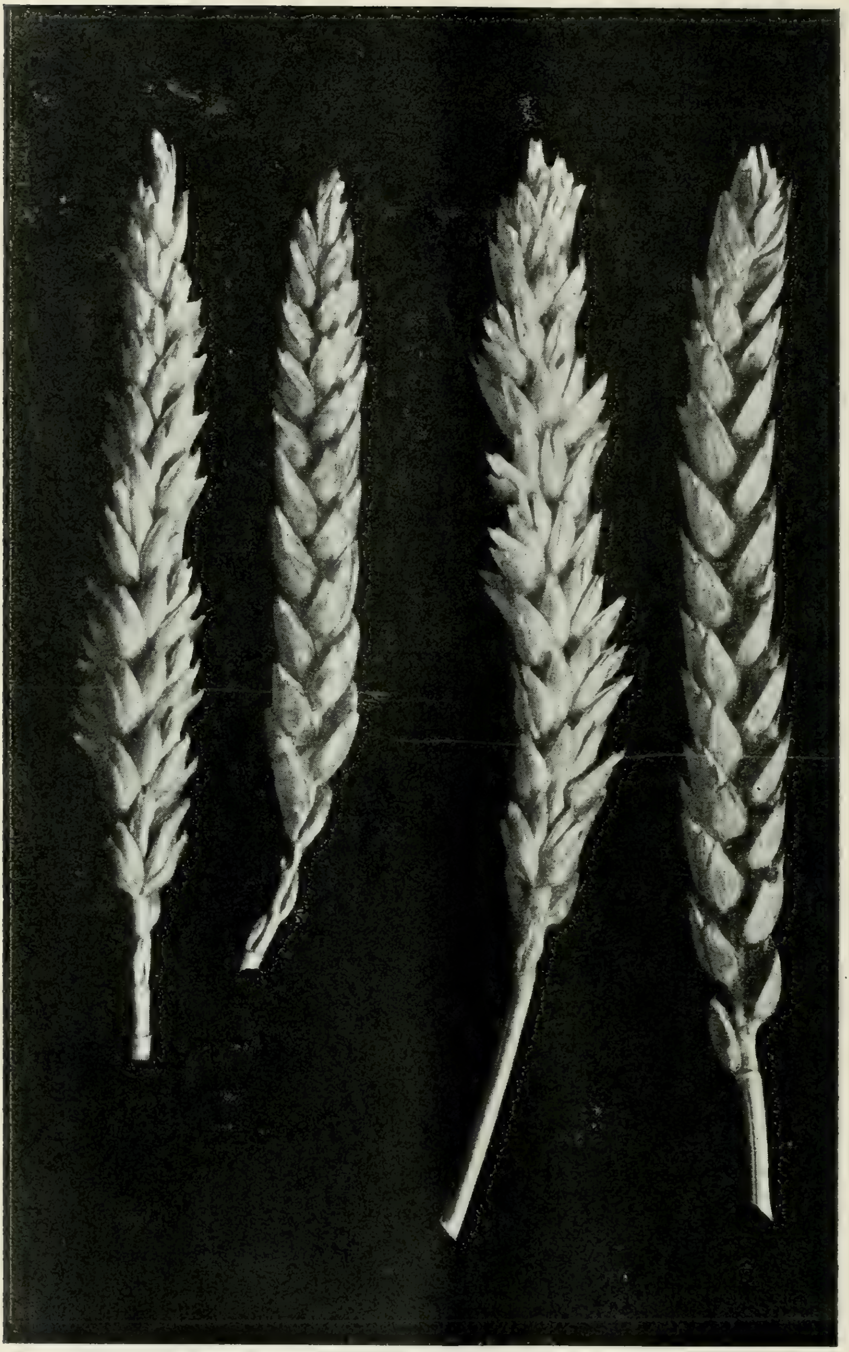
The result was distinctly encouraging, the lead arsenate being spread so evenly that it appeared like a heavy bloom on the fruit, and only 4·8 per cent. of fruit affected with codlin moth could be found; among the varieties so treated was Emperor Alexander, "which is known everywhere as one of the worst apples for codlin moth."

The advantages of this combined spray will hardly require to be pointed out. Codlin moth, woolly aphis, and scale insects are all reached in the one operation.



Cowra No. 15 x Cowra No. 19.

SELECTION AS APPLIED TO FIELD CROPS AND CROSSBREDS.



Cowra No. 15. **Cowra No. 19.**

Selection as Applied to Field Crops and Crossbreds.

Selection as Applied to Field Crops and Crossbreds.

J. T. PRIDHAM, Plant Breeder.

ALTHOUGH the principles of selection are the same whether applied to bulk crops in the field or to the rows obtained by plant breeders as the result of their cross-breeding work, there are important differences in the method of treatment.

A plant that takes the eye in a crop may be a productive individual of the variety which will not become any more productive when propagated. Indeed, to maintain such individuals at their present standard, selection to exclude mediocre or poor yielding mother plants must be kept up, though any better yield than that of the original choice need not be expected. The assurance that no novelty or brand-new variety is to result from such a process does not detract from the important and remunerative character of the work.

On the other hand, a striking individual in a crop may, if grown the following season, perpetuate its distinctive characters, it being in the nature of a sport, or a variation from the type. Two years' trial may show it to be of sufficient merit and constancy to be sown on a larger scale and subjected, as a new and superior variety of the old type, to the selective process described above.

A third class of variation is sometimes found that when again grown splits up into more than one type, just as in the case of a cross. This occurs with a natural crossbred. It may take a number of years to isolate the most desirable type, and seed from as many plants as possible should be sown in the earlier stages of the process of elimination. If, however, the selections do not show the same outstanding merit in the direction of productiveness, it is of no use to waste further time with them. A new variety of celery, for instance, with an extremely short stalk and abundant foliage, is a worthless novelty to the market gardener since celery is valued for the length and thickness of its stalk. The second season will usually determine whether a selection is worth being persevered with. If the variation is due to some local advantage in the shape of additional manure, moisture or root range, it is very unlikely that identically similar conditions would obtain the following year; in any case the character of the season would not exactly correspond.

The procedure with artificial crossbreds may be illustrated by the nursery history of two that are under treatment at Cowra. In order to slightly improve the quality of the grain and to retain the good straw and heavy cropping characters of Federation, that variety was crossed with Cowra No. 15, a variety with complicated pedigree, and a rather dense, broad ear, straw of medium height, and an erect habit until harvested. It is a mid-season to late variety, parts readily with its grain to the harvester or stripper, but does not shell. The grain is of the medium strong class, and its defect is apparently a delicate constitution, which it is hoped Federation will strengthen. The cross was made in 1914.

9		F_1	grains	were	sown in	1915,	from	which	4	plants	were	taken.
4	plots	F_2	seed	,,	,,	1916,	,,	,,	1,300	,,	,,	,,
1,300	,,	F_3	,,	,,	,,	1917,	,,	,,	680	,,	,,	,,
680	,,	F_4	,,	,,	,,	1918,	,,	,,	125	,,	,,	,,
125	,,	F_5	,,	,,	,,	1919.						

(F1=First Generation.)

Some of the selections have a brown ear like Federation, and others a white one like Cowra No. 15. The great majority have the brown ear colour, indicating that in the most vigorous mother plants Federation predominates.

The second of the two crosses mentioned above is Cowra No. 15 x Cowra No. 19. Cowra No. 19 is a full sister to Redilla, a wheat which has done well in some of the breeding plots of the Department of Agriculture in Victoria. Both Cowra No. 15 and Cowra No. 19 are Farrer crossbreds of a productive type, but the latter stools somewhat sparsely, ripening early, with grain which is of the soft flour class. The combination of these two parents should result in a wheat ripening mid-season to early, with grain of medium soft character. The straw of Cowra No. 19 is hardly strong enough to support the heavy ear, but this should be corrected in the union with Cowra No. 15. The cross was made in 1916.

54	F_1	seeds	sown in	1917,	yielded selections from which
about 2,680	F_2	,,	,,	1918;	of these 128 plants were taken, affording
about 5,600	F_3	,,	,,	1919.	

It will be remarked that in both cases the largest number of crossbred seeds sown were those of the third generation from the cross. At this stage variation is greatest, and we then begin to reduce the sowings. In two more years we should have the Federation x Cowra No. 15 selections down to a dozen individuals or perhaps half-a-dozen. Similarly, the Cowra No. 15 x Cowra No. 19 selections will be narrowed down as the crossbred shows signs of becoming fixed.

As illustrating the manner in which certain characters of the parents reappear in the crossbred, the plate which appears in conjunction with this article will be found interesting. Heads of the crossbred Federation x Cowra No. 15 were not available, but those of the cross Cowra No. 15 x Cowra No. 19 are sufficient for the purpose.

FLEAS INFESTING ANIMALS.

FOR the purposes of an English correspondent, the Government Entomologist, Mr. W. W. Froggatt, is desirous of receiving specimens of the fleas found on Australian mammals, birds and reptiles. To any person who would be willing to make a collection, small spirit tubes would be sent for the purpose, with instructions about collecting and forwarding specimens.

Fodder Crops for Dairy Farmers.

The South Coast.

R. N. MAKIN, Inspector of Agriculture.

It is universally admitted that to obtain the best results from dairy cattle, careful consideration must be given to the feeding. Good pastures, of course, are indispensable, but no matter how good they may be, there are times during the year when they are not sufficient. It is then that green fodder crops, either in their green state or in the form of silage, become essential to the maintenance of the milk flow and of the condition of the animals. As a matter of fact, more extensive feeding by the dairy-farmer would be a profitable undertaking, even when grass was at its best. The land returns a greater abundance of food when cropped than when under grass, and with the high prices that are ruling at present farmers should seriously consider how the carrying capacity of their farms might be increased. Further, green crops are extremely useful in providing a cheap feed for pigs, and this alone would make cropping profitable.

The weather is an important factor in the growing of green crops, and to be successful a farmer should conduct his operations in such a way as to take advantage of favourable conditions and to be prepared for worse ones. Normally, the rainfall on the South Coast is sufficient from December to May—indeed very often more than sufficient—as monsoonal rains of heavy character may be expected any month in that period, while from June to November dry, windy weather is the rule.

With such a distribution of the rainfall, the preparation of land for summer crops should take place, if possible, in the autumn or early winter, with the object of conserving as much moisture as possible in the subsoil. Ploughing at that time is usually easy, whereas if deferred till spring it is often found very difficult, owing to the soil having become dry and hard. The harrow should follow the plough closely to prevent loss of moisture. A little shallow surface cultivation at times would also be of value.

Spring and Summer Crops.—Crops suitable for spring sowing are maize, sorghum (Planter's Friend, Saccaline and Amber Cane), Sudan grass and cowpeas. Improved Yellow Dent maize is specially recommended on account of its fine stems and its tendency to hold the sap in the stalk longer than most varieties. In the past many farmers sowed maize broadcast, but this is now largely giving place to drilling. Drilled maize may be cultivated, and thus made to give a good crop in dry seasons when broadcast maize is a failure. Over 40 tons per acre has been cut from drilled maize, and an average of 20 to 25 tons may reasonably be expected when proper attention is given. Sown with the drill, about 25 lb. of seed per acre are sufficient, but if the grain is big, allowance should be made by sowing a greater weight. In the Department's experiments on the South Coast an application of fertiliser has been found beneficial when sowing maize and other crops. The mixture recommended is superphosphate and bonedust in equal parts, applied at the rate of 2 cwt. per acre.

Amongst sorghums, Saccaline is strongly recommended, as heavy growth is made, and apparently it is not so subject to disease as other varieties. On this account it is likely to be valuable as a winter fodder. Planter's Friend is still a favourite with many South Coast farmers, but owing to the liability of sorghums to disease they are not now so extensively grown for winter feed as formerly, their places having been taken by wheat and oats sown early in the autumn.

Japanese millet is a valuable catch crop. The best results might be obtained by sowing in January or February—in time to catch the autumn rains. If the weather conditions are at all favourable, from 7 to 14 tons per acre may be expected two months after sowing, by which time the grasses have hardly commenced to grow.

Sudan grass gives several cuts if sown early in the summer. So far it has been rather disappointing on the South Coast, but this is probably owing to sowings having been made too late.

Autumn and Winter Crops.—Every opportunity should be seized to get the land broken up early for the autumn sowing. In fact, when a crop is removed the land should be broken up as soon as possible; in that condition it sweetens and whatever rain falls is absorbed and will be of benefit to the succeeding crop.

Wheat and oats are now being largely grown on the South Coast. The farmers' experiment plot system has introduced many varieties of wheat and oats new to the coast, and demonstrated their value to the dairy-farmer, but many growers, in their anxiety for early feed, sow too early, and consequently the results are disappointing, owing to the crops running to ear without producing any bulk of feed. When such early feed is required, Japanese millet should be used in preference. Wheat and oats should be sown from the middle of March until May. The varieties of wheat recommended are Florence, Firbank and Thew; and of oats, Ruakura and Sunrise. March-sown crops will be available about the end of June and during July, when the sorghum is about exhausted, and later sowings will provide feed until about the middle of November, when early-sown maize will be coming in.

On every farm where there is suitable land, lucerne should have a place It grows throughout the summer, and produces feed of unexcelled feeding quality. Where pigs are liberally provided with green lucerne, only a small quantity of concentrated feeds, such as grain, is required, and consequently they can be raised at a minimum cost. Any farmer who has doubts as to his soil being suitable for this crop, or who requires advice on any other point in connection with crop-raising, should not hesitate to communicate with the Department of Agriculture.

The following table will be useful as a guide in the growing of crops to provide a rotation of feed throughout the year:—

SOWING TABLE for Green Fodder Crops, South Coast.

Crop.	When to Sow.	Quantity of Seed per acre.	How to Sow.	Available for Grazing or Cutting.
Maize	Sept. to Jan.	25 lb. to 30 lb.	In drills 2 feet 6 inches to 3 feet apart.	December to May.
Sorghums	,, ,,	30 lb. to 40 lb.	Broadcast	December to June.
Sudan Grass	,, ,,	10 lb. to 12 lb.	,, ...	November to June.
Japanese Millet	Jan. to March	7 lb. to 10 lb.	,, ...	March to June.
Cowpeas	Oct. to Dec.	Alone 20 lb. With Maize, 7 lb to 8 lb.	,, .. In drills	January to June.
Wheat	March to May	Drilled, 1½ Bushels Broadcast, 2 Bushels	,, or broadcast ..	July to November.
Oats				
Barley				
Rye				
Field Peas..	,, ,,	Broadcast, 60 lb. with other crops, 30 lb. to 40 lb.	,, ,,	,, ,,
Perennial Red Clover ..	Jan. to April	12 lb.	Broadcast	Perennial.
Lucerne	Feb. to May	15 lb. to 16 lb.	,, ...	October to May.

Application of the fertilisers superphosphate and bonedust, 1 cwt. each mixed, per acre, is recommended in all cases.

The Western District.

J. E. SYME, Inspector of Agriculture.

FARMERS engaged in dairying in western districts often find it necessary to supplement the natural grasses with fodder crops that can either be grazed off or be cut and fed to the stock in a green condition.

While it is more satisfactory to have a well-balanced ration containing the right proportions of proteids and carbohydrates, it has been found that a cow supplied with large quantities of green feed will always give satisfactory returns.

The months in which grass is usually scanty are those in which the cows require extra feed to keep up the body temperature as well as the supply of milk, and these are the months in which supplementary fodder should be available. Most farmers feed hay or chaff during the months of May, June and July, as the pastures are generally bare; but much superior fodder to these can be obtained for the early winter months by planting Skinless or Cape barley in January and February at the rate of 1 bushel of seed per acre, adding ½ a bushel of Golden vetches or Black tares and 56 lb. of superphosphate. In most seasons this will provide an excellent growth for grazing by May. By July this mixture will be ready to cut for soiling purposes; and by making later sowings in March and April, feed can be ensured for August and September. The area put in must be determined by the number of cows to be fed, but it should be borne in mind that larger areas will be required if the crop is grazed than if it is cut and fed to stock. For August, September, October and November a mixture of oats and peas can be grown with advantage. Sunrise oats are preferable for early feeding, and

Algerian oats for late feeding. Both should be sown at the rate of 1 bushel per acre, with ½ a bushel of Canadian or Egyptian field peas; 56 lb. of superphosphate should also be added.

For summer feeding there are many fodders to choose from, notably the millets, sorghums, maize, Sudan grass, and red clover. Hungarian or Japanese millet may be sown in September to provide feed for the end of November and December. About 20 lb. of seed to the acre, mixed with about 56 lb. of superphosphate and sown through the manure box of the drill, gives satisfactory results. It should not be sown too deeply, the lever being lifted out of the notch and allowed to hang, so that the manure distributor is in gear. Sowings of these millets may be made until January.

Early Leaming and Improved Yellow Dent maize if sown at the end of September will provide feed for January, and later sowings will provide feed for February and March. Maize may be sown at the rate of about 10 to 14 lb. to the acre with the ordinary wheat drill, setting the drill to the lowest amount it will sow, and closing some of the cups so that the seed will be dropped in rows about 3 feet apart. Superphosphate at 28 to 56 lb. per acre will also be found beneficial. A more balanced ration can be secured by sowing cowpeas with the maize. The Black or Clay-coloured may be sown in between the rows of maize when it has got too high to cultivate, or it can be mixed with the maize seed and a larger amount sown.

The saccarine sorghums (*Sorghum saccharatum*, Early Amber Cane and Planter's Friend) may also be sown in September and until November for feed for January, February, March and April; they should be sown in the same way as is suggested above for maize, using about 6 to 8 lb. of seed an acre. The grain sorghums Feterita and Milo, though introduced mainly for their grain—producing 30 to 40 bushels in an ordinary season—have also been found to be very much appreciated by stock as forage, and indications point to the fact that stock rather prefer the feed when it has dried a little. These crops will provide feed right up to the time when the barley and oats are ready.

One of the best feeds in the summer for dairy cows is a mixture of Sudan grass and Chilian clover sown in October; about three cuttings of green fodder can be obtained from a good stand during the first year, the first growth being ready for the mower in December, the second about six weeks later, and a third growth can either be cut later again or be grazed off in the autumn. If cut and made into hay, this valuable mixture is relished by stock, for it makes a bright, palatable hay, with a good aroma, and the clover improves it as a ration, materially increasing the proportion of proteids. The crop should be planted by mixing about 2 lb. of Chilian clover with about 4 lb. of Sudan grass, and sowing through every fifth cup of the wheat drill, set in its lowest gear. The seed being very light, runs through very slowly, sowing about 6 lb. to the acre. The foregoing gives some idea of the resources of the dairy-farmer in the way of green fodder if he is disposed to take advantage of them. It is certain that by growing crops he can supplement his pastures in a most profitable manner. In most years he will be able to carry more stock, and the average milk yield will be higher. Even when the season is so dry that little grass is growing, some growth is made by cultivated crops, as has been amply demonstrated in the present year.

A number of farmers who were conducting experiments in conjunction with the Department of Agriculture with sorghums and Sudan grass found in the past summer and autumn that these crops provided the only feed they had. For ensuring autumn and winter feed after a dry summer, wheat, oats or barley are particularly valuable, for when sown before rain they make rapid growth and provide good feed long before the grass is high enough for cattle to get a bite. Field peas and tares in combination with these cereals can be recommended as improving the feeding value of the material. Our experience shows that they are hardy and in the present season they made more abundant growth than the cereals. Seasons do occur, however, when these crops will be insufficient to provide food, and against such periods dairy-farmers are strongly urged to protect themselves by creating a reserve of silage. The utility of fodder conserved in this way is far beyond the experimental stage, and in inland districts it can be made at a cost as low as 8s. per ton. As a milk-producer it is almost as good as green feed, and very much superior to wheaten or oaten chaff.

SOWING TABLE for Green Fodders for Western Districts.

Crop.	When to Sow.	Quantity of Seed per acre.	How to Sow.	Ready for Grazing.	Ready for Cutting.
Barley	Jan. and Feb.	1 Bushel	In drills 7 inches apart	May and June	July
Barley and Tares	,, ,,	1 Bushel Barley ½ Bushel Tares	,, ,,	,, ,,	,,
,, ,, ..	March and April	,, ,,	,, ,,	July and August	Aug. to Oct.
Oats	April and May	1 Bushel	,, ,,	September	Oct. and Nov.
Oats and Peas ..	,, ,,	1 Bushel Oats ½ Bushel Peas	....	,,	,, ,,
Japanese Millet..	September	20 lb.	,, ,,	November	Nov. and Dec.
Maize	Sept. to Dec.	25 lb.	In drills 3 feet apart	January	Jan. to March
Sorghums ..	,, ,,	6 lb. to 8 lb.	,, ,,	....	,, ,,
Sudan Grass ..	Sept. and Oct.	6 lb.	,, ,,	December	Dec. to April
Sudan Grass and Chilian Clover.	,, ,,	Grass, 4 lb. Clover, 2 lb.	,, ,,	,,	,,

56 lb. superphosphate should be applied with the seed throughout.

THE WEEPING WILLOW AS A FODDER PLANT

A WELL-KNOWN pastoralist of New England, who has done good work, not only in stock-raising but in tree-planting, writes as follows:—"It may interest you to know that I made very successful use of the foliage of *Salix Babylonica*, or Weeping Willow, as a fodder for milch cows during the past dry summer, the milk flow almost doubling after a few days' feeding."

The use of willow as a stock food is not new, but its value is not nearly as well known as it ought to be, which is the excuse for this note. In most parts of the State it is still not too late to plant cuttings of willows.—J. H. MAIDEN.

Popular Descriptions of Grasses.

[Continued from page 493.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE PASPALUM GRASSES.

In many respects the Paspalum grasses resemble the Panics. Like those grasses, they have individual seed-bearing spikelets, they inhabit the warm countries of the globe, and they provide good palatable fodders. On the other hand, the Paspalums may be distinguished by the fact that they have only three glumes surrounding the seed instead of four, as in the Panics.

The Paspalum grasses are not as abundant as the Panic grasses, nor are there nearly so many varieties. The native species of Australia are four in number, none of them being as abundant as the common introduced variety, *Paspalum dilatatum.*

The Paspalum grasses of economic importance in New South Wales are *Paspalum dilatatum, P. compressum* (Carpet grass), and the native grass *P. distichum* (Water Couch).

Paspalum dilatatum (Fig. 1).

So much has been written in previous articles of the *Gazette* and in Farmers' Bulletin No. 96, "Pasture Grasses," that a further detailed description of this grass would be superfluous, but its principal features may be summarised as follows:—

1. The ideal conditions for this grass are long, hot summers, a good rainfall, and volcanic or alluvial soils.

2. There are very few localities in the dairying districts of the State where this grass has not been grown for pasture.

3. At least 10 to 12 lb. of good hand-shaken seed are required per acre. The seed may lie in the ground some considerable time before germinating.

4. Paspalum is not appreciated by stock if it is allowed to grow up into flower stalk.

5. A dairy herd should not be raised on Paspalum alone. Paddocks should be laid down of other grasses, such as cocksfoot, rye grass, Para grass, or Rhodes grass, &c. In any case the feed should be supplemented with a legume such as lucerne or clover, or oil-cake wherever possible.

6. Paspalum grass will worry summer crops if not checked. For this reason, in districts where paspalum occurs, all summer crops like maize, sorghum, &c., should be sown in rows, so that scuffling can be constantly carried out. This, and this alone, will prevent the grass from invading cultivated crops.

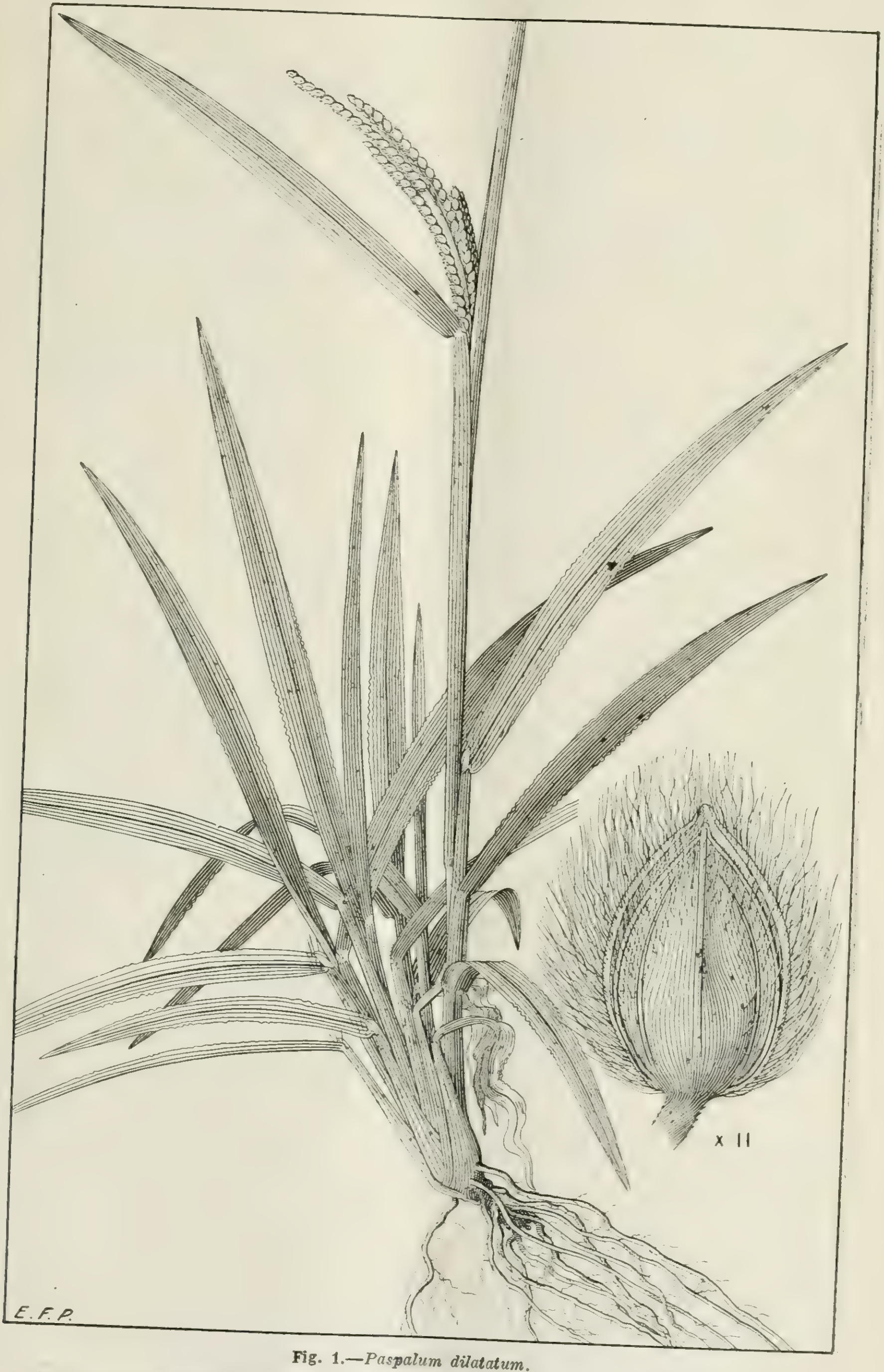


Fig. 1.—*Paspalum dilatatum.*

Note the wide succulent leaves—characteristic of grasses requiring abundant moisture and heat.

7. A Paspalum pasture will certainly deteriorate after a few years. It should then be ploughed up, the land put down to a summer crop, and afterwards allowed to revert to Paspalum if a permanent pasture is desired. One method of dealing with a Paspalum pasture is to plough with a mouldboard plough, setting it at about 5 inches, or just below the roots. Three horses will plough about half an acre per day. Then disc-harrow the crests three or four times, doing 4 or 5 acres per day. The whole operation should be followed by the sowing of a clover crop, the ground being rolled before the seed is sown. This is the method adopted by the Manager of Wollongbar Experiment Farm, and very satisfactory results have been obtained with it.

8. Do not plant Paspalum on light soils or hilly country. Rhodes grass is far preferable in such situations. The natural habitat of Paspalum is low-lying land, and when once established in this situation it is useless for a grass to compete with it.

9. Paspalum makes hay of fair quality, providing it is cut before it is too mature. Paspalum hay seems to be preferable to Paspalum ensilage.

10. Paspalum will not stand exceedingly dry weather, while Rhodes grass will. Hardly a green blade of Paspalum is to be seen in the Richmond district at the present time, owing to the prolonged spell of dry weather, while Rhodes is green everywhere.

11. *Paspalum dilatatum* is often confused with *P. virgatum* (see Fig. 2) in North Coast pastures. The latter is obtaining a hold amongst *Paspalum dilatatum*; but it can readily be distinguished by its more abundant inflorescence, by its more upright habit, and by the fact that it is always neglected by stock when the better known variety is about.

CARPET GRASS (*Paspalum compressum*) (Fig. 3).

This grass has been introduced from America. Unlike *Paspalum dilatatum* it has creeping rootstocks, which sometimes extend to a considerable distance. It can readily be distinguished from Water couch, another creeping Paspalum, by its short, broad leaves and its less abundant inflorescence. Carpet grass is also very different in shape from the inflorescence of Water couch, having longer spikes not unlike Summer grass. When ripe, the seed readily falls from the lower ends of the spikes.

This grass is very abundant in the warm parts of America, where it is sometimes known as "Louisiana grass," and according to Piper, it is called by the Creoles "petit gazon." It is recorded from America that it is an excellent grass for sandy or poor soils, that it will stand heavy stocking, and that it is very palatable. There is little commercial seed on the market, and the grass is propagated by scattering small pieces of sod about the ploughed field, as in the case of our ordinary couch grass.

The Hawaiian Experiment Station reports that one season's trial shows that it is as drought-resistant as *Paspalum dilatatum*, but under moist conditions is much less vigorous in its growth. Although it spreads very rapidly because of its creeping stems and runners, it furnishes less feed than *Paspalum dilatatum*.

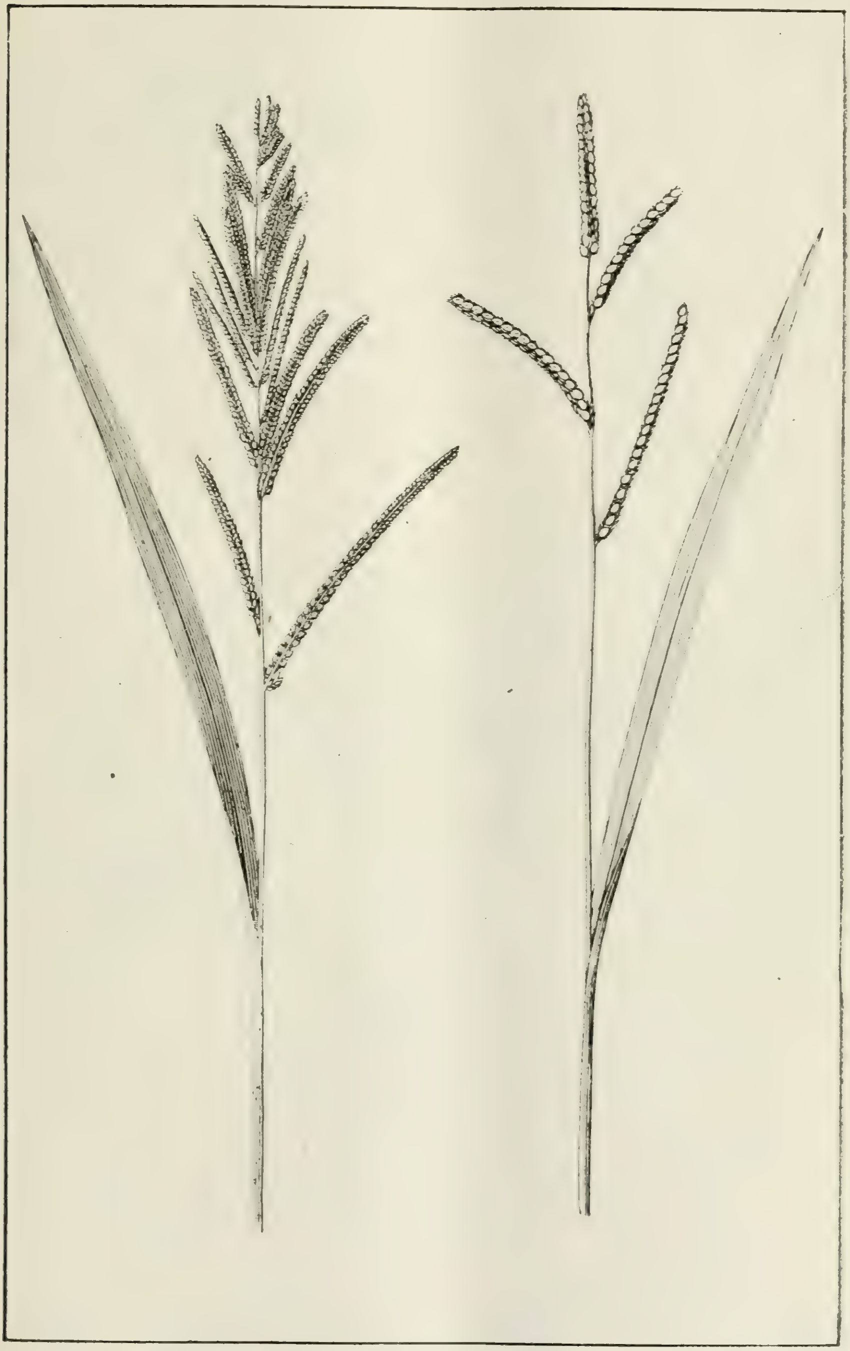


Fig. 2.—*Paspalum virgatum* on the left and *Paspalum dilatatum* on the right.

Note the crowded flowering branches in *P. virgatum.*

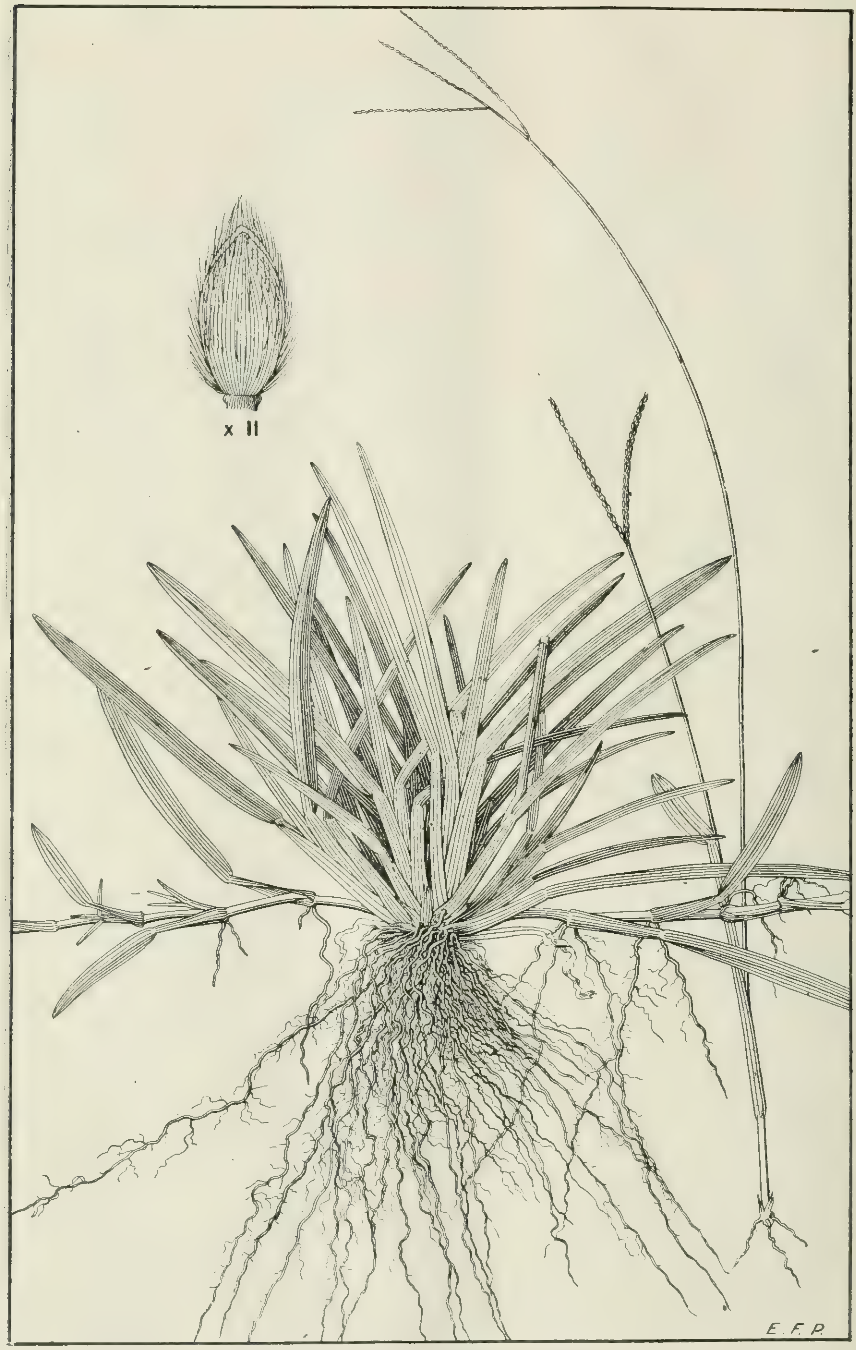


Fig. 3.—Carpet Grass (*Paspalum compressum*).

Distinguised from most Paspalums by its running roots, and from *P. distichum* by its smaller spikelets and its seeds falling when ripe.

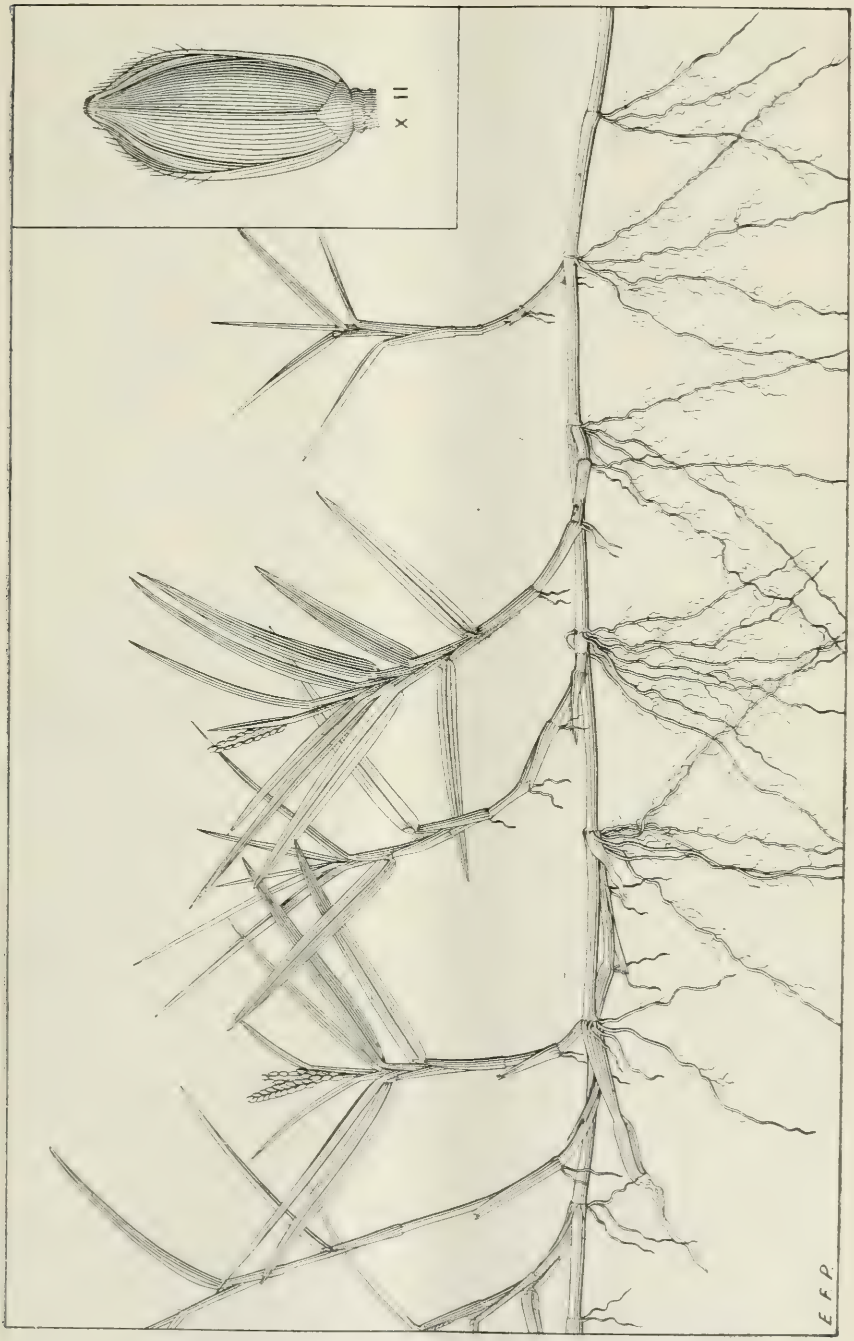


Fig. 4.—Water Couch or Swamp Couch (*Paspalum distichum*).

Note the vigorous running roots and the spikelets larger than in *P. compressum*.

Carpet grass is obtaining a good hold in the coastal districts of New South Wales, particularly in the warmer districts, such as the Middle and Northern rivers. For some considerable time it was confused by dairymen with Buffalo grass, and its virtues were not sufficiently known until some hay made from the grass was sold at a good figure on the Sussex-street market. Messrs. Yates & Co., the Sydney seedsmen, quote a correspondent from Bungawalbyn as follows:—"This running Paspalum grows everywhere, and the poorer the land the better it stands the weather. It is a good grass. The sample I have taken is off a patch of land that would not grow any other grass before, and the Paspalum has rooted the whole of the farm. It stands the dry weather very well, also the wet and frosty weather. It is a very good grass for dairying, as I have some of my cows on it at present, and they are doing very well. It runs along the ground very much like Buffalo."

The experience in New South Wales appears to indicate that Carpet grass can never be expected to compete with *Paspalum dilatatum* on ordinary soils, but for poor soils it has a decided value. It is best propagated in the spring or early autumn by planting sod or rooted cuttings. Its vigorous habit enables it to spread over a large area.

WATER COUCH GRASS (*Paspalum distichum*) (Fig. 4).

Although Water couch is a native of New South Wales it is also found in warm situations in America and the South Sea islands. It is particularly common in the coastal districts of this State, where it is a common sight in swamps, low-lying depressions and alluvial flats in the summer months of the year. Water couch is distinguished from the Paspalum previously described by the fact (1) that the leaves are much smaller than in Carpet grass or the ordinary Paspalum, and (2) that the spikes of the inflorescence, in comparison with those of the other Paspalums, are very small.

Water couch is known in America as Eternity grass, Knot grass, or Joint grass, and is there credited with being a particularly valuable fodder plant.

Water couch is fairly common right along the coast of New South Wales, and in many parts is becoming a bad weed in maize and other summer crops. It does not, however, grow so well in shade as Summer grass, and is more easily kept under by cultivation in tall-growing crops. Paddocks on the South Coast devoted to rye grass have been known to be completely overrun in a single summer season by this grass. Under moist conditions the rapidity of its growth is remarkable; probably it is superior to ordinary Paspalum or couch in this respect. Although common to moist situations, it is not wholly a water grass, as it will endure drought conditions very well. Dairymen on the Hunter, Manning, and Macleay Rivers are quite content to devote whole paddocks to it during the summer and autumn months rather than lay down *Paspalum dilatatum*. It will stand a good deal of feeding off, and must be considered an excellent grass for fattening and producing milk. It does not make good hay owing to difficulty in curing it, probably due to its succulent character.

Water couch grass is often seen in Sydney lawns. In such situations it must be considered a weed, as owing to the rapidity of its growth it requires to be cut about every second day. It is also much affected by cold weather, and then presents a very unattractive appearance.

The seed of this valuable grass is not on the market, but propagation can be easily carried out by planting sods or rooted cuttings along the edges of swamps or low-lying depressions. This should be done in the spring months of the year.

(To be continued.)

CURING OF LEMONS WITH VASELINE.

A SCONE orchardist, anxious to keep some of a good crop of lemons for summer use, recently sought information as to the efficacy of a vaseline treatment and the comparative values of curing treatments. The Department's reply was as follows:—

The following experiments with Washington Navel oranges and lemons were carried out fortnightly, commencing 14th June, 1918, and ending 7th August, 1918, at Yanco Experiment Farm:—

Fruit wrapped and packed in paper-lined cases; also in sand.
Fruit vaselined and packed in paper-lined cases; also in sand.
Fruit unwrapped and packed in paper-lined cases; also in sand.
Fruit dipped in borax and packed in paper-lined cases; also in sand.

The results from those unwrapped and those treated with borax were not satisfactory, those that had received a coating of vaseline keeping best of all. The lemons so treated kept in perfect condition from June to January, though it would not be advisable to store for market past November on account of the deterioration of the fruit beyond this month.

THE VALUE OF HONEY AS FOOD.

WHEN the food value of honey is reduced to figures, we are surprised to find that a pound section of honey (about 14 oz. net) contains as many calories as twenty eggs. Honey is classed among the carbohydrate foods, and is a source of heat and energy. When it is known that honey contains very little cane sugar, and consists mainly of grape sugar and fruit sugar, it will be realised that honey is a pre-digested food directly available for the production of heat and energy. This explains why honey is unsurpassed for the relief of fatigue, and enables us to understand why Jonathan, wearied in the long pursuit of the Philistines, was so immediately refreshed by a little honey.

Nitrogenous matter occurs in the form of pollen grains always present as an accidental mixture, and there is nitrogen also in the albumen supplied by the bees in the elaboration of the honey. It has recently been shown that honey also contains those mysterious substances known as vitamines, in the absence of which an animal will lose weight, although supplied with a food ration that is otherwise adequate.—JOHN ANDERSON, M.A., B.Sc., North of Scotland College of Agriculture.

AN EXPERIMENT IN TOP-DRESSING LUCERNE.

THE value of top-dressing lucerne with superphosphate was demonstrated last season in a very conclusive manner on the property of Mr. M. F. Dalton, Duntry League, Orange. A paddock that enclosed a good stand of lucerne had nevertheless been giving disappointing results, and the suggestion was made to the manager that portion of it should be top-dressed with superphosphate—one part at 1 cwt. per acre, and another at 2 cwt. per acre—and that the results should be compared with an unmanured portion.

The suggestion was adopted, and the whole paddock was worked with the spring-tooth cultivator both ways in the beginning of August. Later 3 acres were measured off, and again "spring-toothed" late in August, and superphosphate sown with the wheat drill on 29th August. The difference in growth was very marked, the unmanured plot showing in sickly growth mixed with grass, and the leaves dying off as a consequence in the dry weather. The manured plots, on the other hand, grew luxuriantly, and showed a dark healthy green colour. On 25th November the plots were cut, and the crops weighed at once, with the following results:—

	tons	cwt.	lb.
No manure	0	5	64
112 lb. superphosphate per acre	2	12	64
224 lb. superphosphate per acre	3	7	78

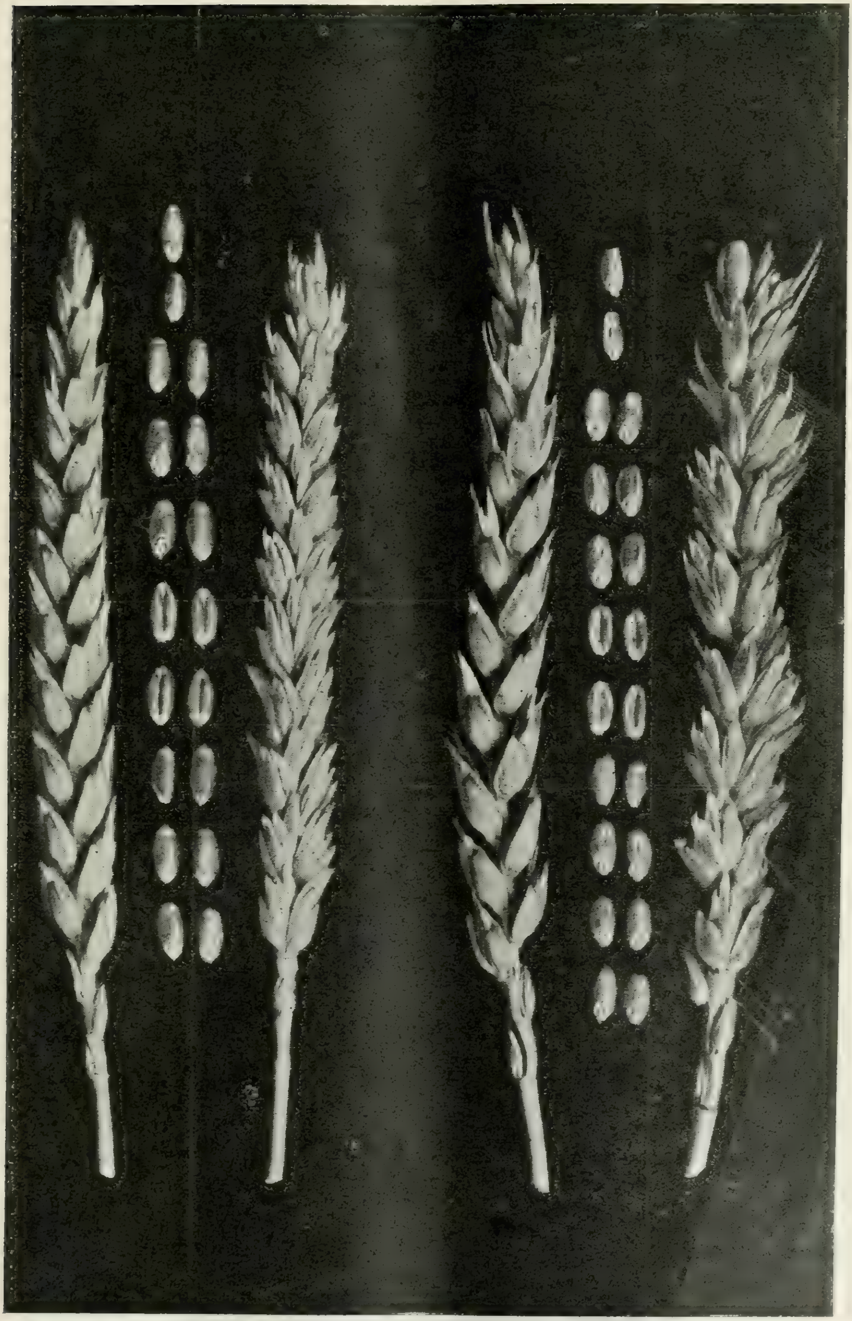
As superphosphate at present costs about 5s. 6d. per cwt., the treatment was obviously worth while, making all the difference between a profitable and an unprofitable stand. The manager was so impressed with the improved yields that he promptly dressed the whole area with superphosphate, and though the very dry weather that followed badly checked growth, the manner in which the lucerne revived after rain came in February, suggested that the fertiliser had really saved the stand from extinction.—J. E. SYME, Assistant Inspector of Agriculture.

FINANCIAL ASSISTANCE FOR FALLOWING.

ENCOURAGED by last year's success of the scheme for assisting farmers to fallow wheat land, the Hon. W. C. Grahame, Minister of Agriculture, has arranged for a continuance of the scheme in the present year, and farmers who desire to take advantage of the offer should communicate with the Under Secretary, Department of Agriculture, Sydney, for information. Forms of application are obtainable from the secretary of the nearest branch of the Farmers and Settlers' Association or Primary Producers' Union.

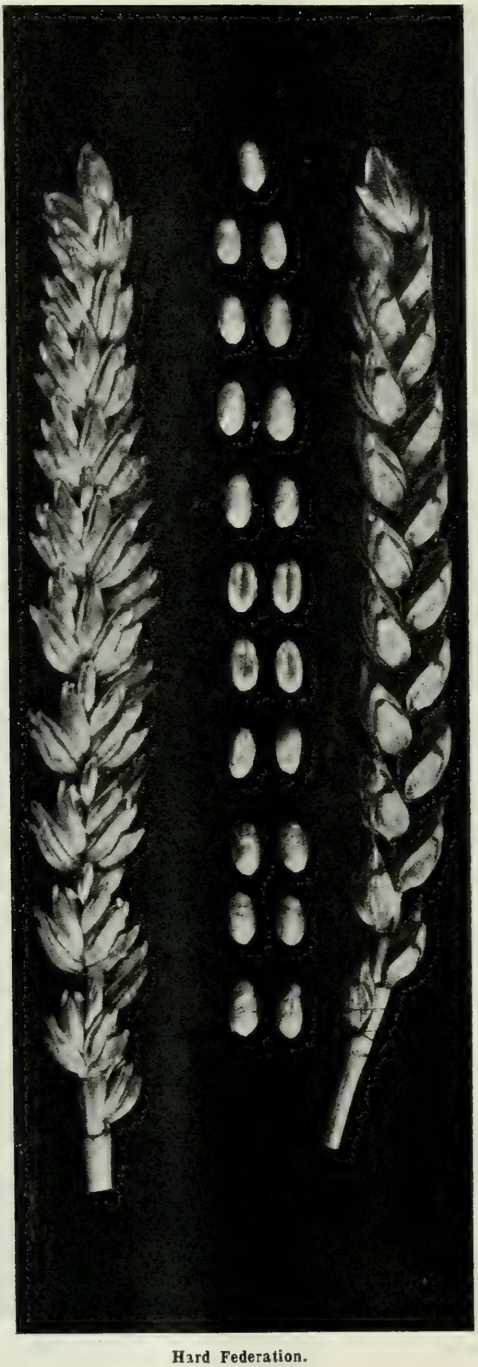
TREATMENT FOR FROST-NIPPED LEMONS.

AN inquiry as to the most suitable treatment for a lemon tree that had been nipped by frost was answered by the Fruit Expert as follows:—"The tree should be cut back to sound wood when the spring has set in. It would also be as well to stimulate the growth of new wood by manuring, cultivation being at the same time well looked after."



Warden. Clarendon

SOME NEW VARIETIES OF WHEAT.



Hard Federation.

Some New Varieties of Wheat.

Some New Varieties of Wheat.

J. T. PRIDHAM, Plant Breeder.

DURING the past few years several new varieties of wheat have taken their places in the Department's recommendations for certain purposes, and others that are quite promising have been under trial in different parts of the State. In view of the satisfactory results obtained with three of these in particular, and of their increasing popularity with farmers, it is felt that the time has arrived for descriptions and illustrations uniform with those published in the past with regard to other varieties to be made available. Two accompanying plates clearly demonstrate the chief characteristics of the heads and grain of Clarendon, Hard Federation and Warden. The descriptions follow.

Clarendon.

This was one of Farrer's crossbreds, the pedigree being—

Eden x Jondhala
Jonathan unnamed
Gluyas' Early unnamed
Bobs unnamed
Clarendon

In its young stages Clarendon has fairly dark green, medium broad leaves. A medium stooler, at heading time the leaves are erect and the foliage rather sparse. It matures very early, ripening a day or two after Canberra. The straw is fairly tall, white, medium stout and not very strong. The ear is erect, slightly awned at the tip, fairly open, uniform, light yellow, with rather widely-spreading spikelets regularly placed. The glumes are fairly long and sharp pointed, being securely attached. The grain is medium hard, a little superior in quality to Canberra, white, medium size, plump, fairly opaque, with a flour strength of about 48. Clarendon threshes easily, but does not shatter; partly resists rust from its Gluyas parentage and partly escapes attack because of its earliness. It yields rather less grain than Canberra, but is less liable to lodge. It is superior to Bunyip in most years, and compares favourably with Thew for coastal conditions, maturing at the same season.

Hard Federation.

This is a selection from Federation, believed to be the product of a natural cross. In outward appearance the two varieties are similar, except that the ears of Hard Federation are rather less dense, the spikelets not being set so closely together, and having a fuller and bolder appearance than those of the old Federation. It ripens about a week earlier, the straw is a little taller, and not quite so strong as in Federation, though it is quite stiff enough to stand in stormy weather until harvested. Hard Federation is a more vigorous grower from the start than its ancestor, and it stands feeding off well. It is rather better for hay on account of its somewhat longer straw than the old Federation, and shows less discoloration of flag and straw in a rusty season, though it is not a rust-resistant variety. Hard Federation received its name from the quality of its grain, and it is in this respect that the most marked difference is seen between the two varieties. The grain is yellow, rather flinty, plump, somewhat rounded, and does not bleach to any extent. This feature, together with its satisfactory flour strength, has brought it into favour with millers. It yields well in the western and north-western districts, but is, as a rule, out-yielded in the southern districts by the old Federation. The average flour strength is 48 with 11 per cent. dry gluten. Hard Federation is a good general purpose early variety. Variations from type are found from time to time, but without being sufficiently marked to cause the farmer any apprehension.

Warden.

Warden is the result of a cross made by Mr. Pye, of Dookie College, Victoria. Its pedigree is:—

$$\underbrace{\underbrace{\text{Quartz x Ward's White}}_{\text{unnamed}} \qquad \text{Red Bordeaux}}_{\text{Warden.}}$$

In its rather profuse, young growth, Warden has a prostrate habit. The dark green leaves at heading time are rather glaucous, narrow and erect. The straw is quite tall, white, strong, fairly stout and tough, but not coarse. Warden is *par excellence* a hay wheat, showing a decided green tinge to the foot, and the straw not carrying too much flag. The ear is white, erect, with a slight tip awn, long, medium, open, uniform, with acute tip. The spikelets are narrow and regular with firmly attached glumes. The grain is soft, of medium size, elongated, pale red, opaque, and of the soft flour class. A very fair grain-yielder, it threshes readily. It is a mid-season to late variety, ripening slightly before Zealand. The latter wheat not infrequently beats it for yield, but lacks the prime quality of Warden for hay.

FAILURE OF A TOMATO TREE TO FRUIT.

THE Department recently received an inquiry from a Sydney correspondent concerning a tomato tree, which, he said, blossomed but lost its flower without producing fruit. The previous winter the leaves of the plant had blackened and fallen off.

The writer was informed that the failure of the plant to set fruit was probably due to unfavourable conditions. In hot, dry or windy weather the plant's fertilisation is often defective, while a similar result may be caused by its soil being either too damp or too dry. Plants growing in very shady positions also often fail to set fruit.

Selecting and Judging Maize for Show.

[Continued from page 561.]

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

Judging Shelled Maize.

THE following score card is recommended for judging shelled maize for market :—

TABLE II.—Score Card for judging Shelled Maize.

1. Size, shape, and thickness of grain	10
2. Uniformity (shape and size)	5
3. Colour (shade)	5
4. Colour (uniformity)	10
5. Weight per bushel and feeding value	5
6. Dryness	15
7. Sweetness	15
8. Soundness	15
9. Plumpness	10
10. Cleanness	5
11. Brightness	5
Total	100

1. *Size, Shape, and Thickness of Grain.*—The larger-sized grain is always in most favour on the market. It is stated that it is not necessary to crush it for feeding to horses. Small varieties like Leaming are, however, also in favour for poultry. Full-tipped grain is more desirable than pointed grain. Thick grain is desired by millers on account of less bran and waste.

2. *Uniformity of Grain.*—Grain which is uniform in shape and size is sometimes bought up as seed maize at an enhanced price by seedsmen on the open market. In exhibiting shell maize, the tips and butts of the ears are always removed in order to make a more attractive sample in uniformity. In judging shelled grain for seed, this character would be of much greater importance.

3. *Colour of Grain.*—Yellow grain has commanded a greater price on the market, in this State, than any other colour until recent years, when, owing to the increase in cornflour manufacture and the decline in the production of white maize, the latter is sometimes quoted as much as, or slightly in advance of yellow. Yellow grain should be of deep colour, white grain free from brown blotches, and red grain not too dark in colour.

4. *Uniformity of Colour.*—Yellow grain should not contain more than 2 per cent. admixture of white grain, and white grain not more than 5 per cent. admixture of yellow grain. Grain of mixed colour is not as attractive to buyers as grain of pure colour. In judging for seed, purity of colour must be insisted on more strongly.

5. *Weight per Bushel and Feeding Value.*—These factors are closely connected. Grain with a high percentage of soft starch generally has a low bushel weight and low feeding value, and *vice versa*.

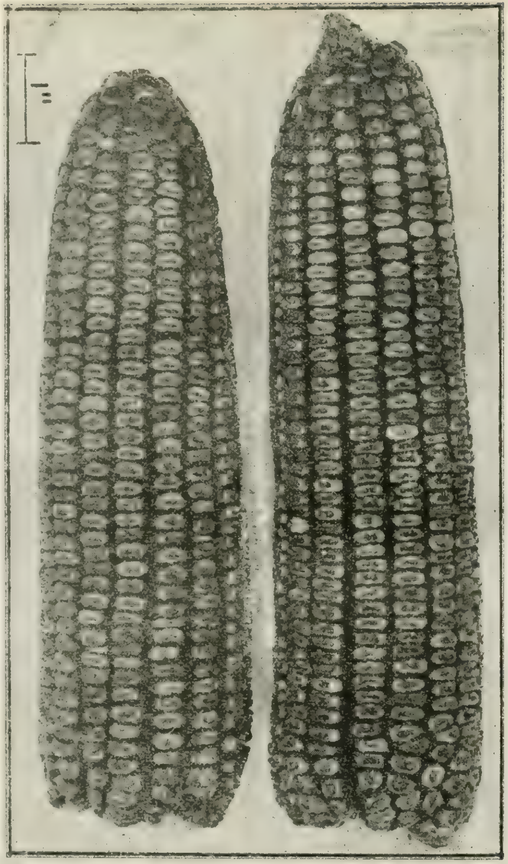


Fig. 7.—Well filled and poorly filled tips.

It is desirable to have the tips of the ears well covered for show.

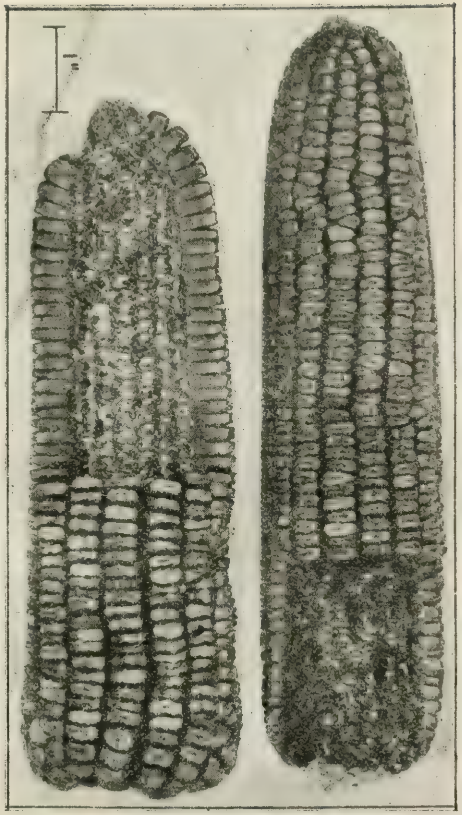


Fig. 8.—Deep and shallow grain.

Density or weight of grain is essential, besides depth.

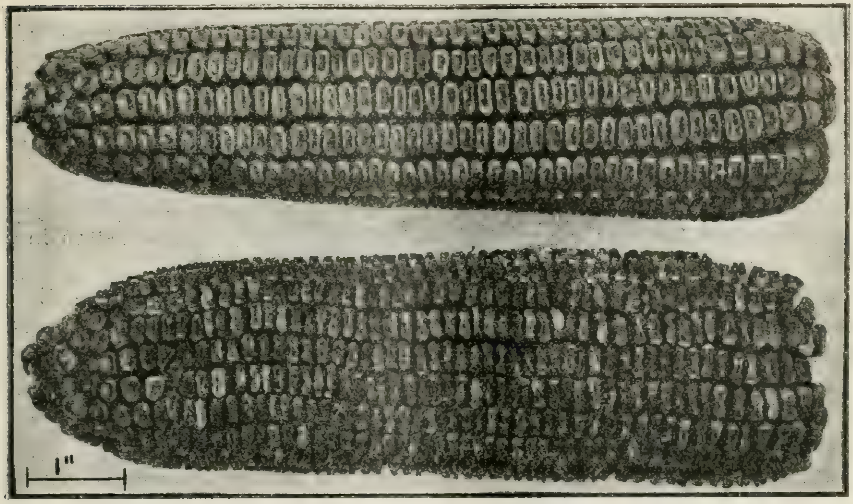


Fig. 10.—Thick and thin grain.

Thick grain means less bran and waste for the miller, and is especially desirable in white varieties from which cornflour is manufactured.

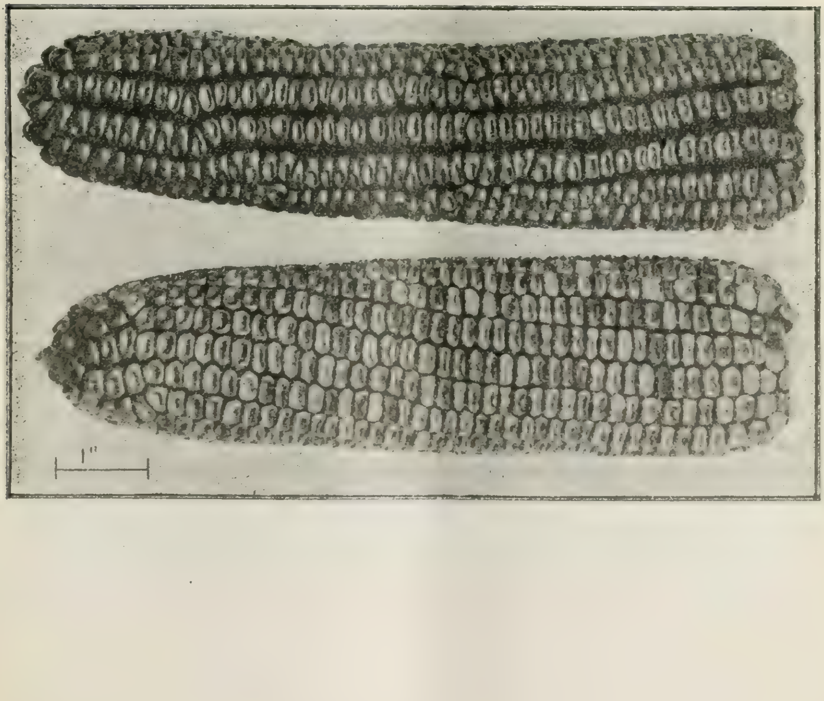


Fig. 9.—Wide and narrow furrows between rows.

Wide furrows between the rows indicate a small amount of grain on the ear; too narrow furrows prevent proper drying, and often indicate pinched, undeveloped grain.

6. *Dryness.*—Prime dry maize will always command a higher price than soft maize, containing much moisture, not only because of the greater weight of dry matter, but because of the danger of wet maize heating. For export, the factor of dryness is more important still, but very little maize is exported from this country. The dryness of the sample is determined largely by the sharpness of the sound when the grain is rattled on to a hard surface.

7. *Sweetness.*—This means freedom from musty odour or mould. This is mostly the natural outcome of bagging wet maize. For market purposes, a musty sample is perhaps more objectionable than a wet sample, because the mustiness cannot be removed, while wet maize can be dried. The sense of smell should be largely relied on to determine this character, and the judge should also be alert for "oiling," which is a trick sometimes resorted to in order to give show maize good weight and brightness of colour.

8. *Soundness.*—This means freedom from injury by weevil or grain moth, and from the presence of these and other insects; also the absence of fungus diseases, and freedom from damage by mice, weather, &c.

9 *Plumpness.*—The sample should be heavy, plump grain, free from pointed grain and blistering on the back of the germ as the result of immaturity, &c.

10. *Cleanness.*—The grain should be free from bits of cob, chaff, dirt or other foreign matter.

11. *Brightness.* – A dull colour is objectionable, being usually due to old seed or to wet maize having been dried and rebagged, or to maize having been harvested wet and then dried.

Growing Show Maize.

No man can expect to win prizes in a maize show unless he first obtains good seed. Just as it is important to have a good sire at the head of a herd, in order to get good show stock, so it is essential that a farmer should have a special seed-plot at the head of his maize crop from which to select his show maize.

It is sometimes thought that for a ten-ear exhibit, it is possible to grow this amount in a back-yard, but anyone with experience in showing maize knows how difficult it is to secure ten good ears from a small plot. The larger the field to select from the better will be the exhibit, for the ideal ear with no imperfections is hard to find.

It is, of course, natural that maize that is being grown for seed or for show should not be sown as thickly as for a commercial crop. At the same time, it is possible to easily err on the side of giving the stalks too much space. There is a limit, particularly with early varieties, which if exceeded will give large coarse ears that would be scored down heavily in several characters.

Where two or more varieties are being grown they can be kept pure by growing them in plots at least 300 or 400 yards apart, or by planting them three or four weeks apart where that is possible. White varieties crossed with red or yellow will usually show the latter colour in the grains the same year, and yellow and red varieties crossed with white will generally show a white cap on top of the grain at harvest time. Small-grained varieties if crossed by a larger-grained variety will also show an immediate increase in size of grain.

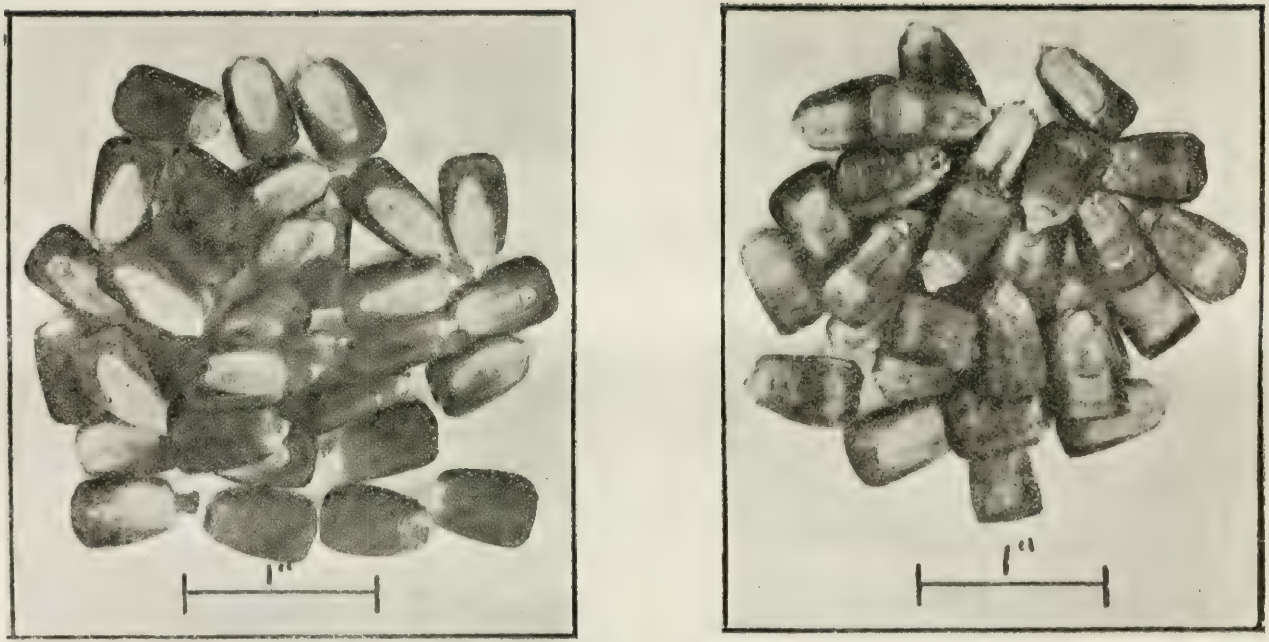


Fig. 11.—Bright colour is desirable

(A) Grain of bright colour indicates care in selection and harvesting.

(B) Grain of poor colour is regarded suspiciously as of low-feeding value.

In colder districts, the application of small quantities of superphosphate will hasten the maturity of the ears by a week or more.

A heavy dressing of stable manure applied to the soil some months in advance of sowing, or planting a leguminous crop (using 2 cwt. superphosphate per acre when drilling in) and then ploughing in the heavy growth as a green manure, is the best treatment for land that is required to grow show maize. Even on rich soils this treatment will give better results.

The ears are best selected in the field after they have been allowed to mature as thoroughly as is necessary. A canvas bag slung round the shoulders will be found useful for holding the selected ears, which must be handled carefully in order that grains are not knocked off. If they require further drying they should be hung up in a well-ventilated place out of the rays of the sun, which would discolour them to some extent. For transporting or sending to the show each ear should be wrapped separately in newspaper, and the whole packed carefully in a box, care being taken, of course, not to keep ears with any degree of excess moisture wrapped up too long.

Shelling maize for show should be done by hand. It is difficult to make a good sample when a machine is used, owing to the cracking of some grain and the inclusion of chaff and bits of cob. Shelling should be left until the maize is thoroughly dry, otherwise the tip cap of many grains will be removed, exposing the black hilum or scar at the base of the grain, and much of the chaff will be left adhering to the grain and will be found difficult to remove.

In displaying exhibits of ears, a crude and objectionable practice at some shows is to hide them in bags, in which only a few ears at the top can be seen. The whole exhibit of ears should be set out side by side, either on an inclined or low flat bench or table, or with the ears held erect on a board studded with nails which pass into the pith at the butt of the cobs, and from which they are easily removed for inspection. In this way the full length of the cobs may be seen.

In some cases, country shows are held too early for that season's maize to be shown, and show exhibits have to be kept over from the previous season. This often discourages would-be exhibitors who cannot keep their maize so long on account of weevil and grain-moth. This difficulty can be surmounted by fumigation with carbon-bisulphide in an air-tight receptacle. Care must be taken to have the maize properly air-dried before enclosing it for some time in this way, and re-fumigation will be necessary two or three times at intervals of three weeks or so during the warmer months if the receptacle is not quite air-tight. The ears should be well-aired before the show to get rid of the odour.

It is advisable to trim up the scraggy butt ends where the shank has been broken off, and the portion of bare tips of the cobs with a sharp knife. One or two grains should be removed from the centre of the ear to see the depth and nature of the grain before it is included in the exhibit, as the outside appearance of the ear is sometimes deceptive.

Some Hints on Judging.

It is important that the judge should have a good knowledge of the characteristics of the varieties exhibited. Unless this is the case, some bad decisions are likely to be given. It should be easy to secure a judge with a knowledge of the varieties that would be exhibited at a country show, but, probably, more difficult to meet this requirement for a State-wide show.

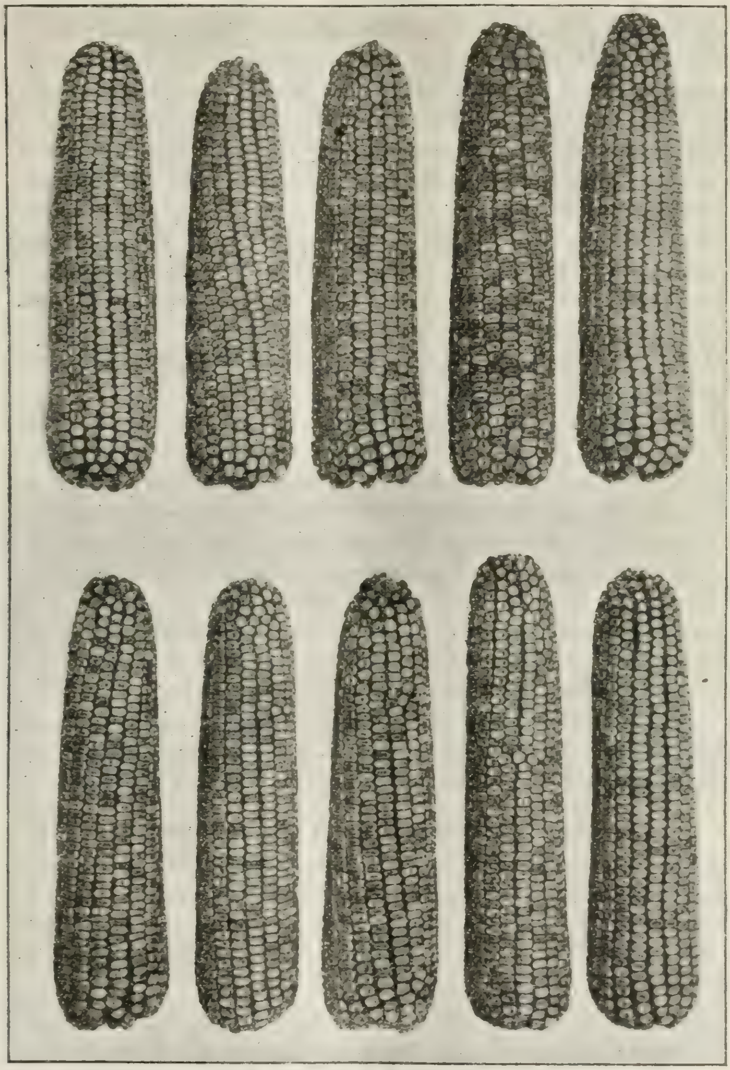


Fig. 12.—A uniform 10-ear exhibit of Funk's Yellow Dent, which has scored nearly the possible points on the score card.

In using a score card, it is impossible for the judge to do successful work if he attempts to make deductions of points with any mathematical precision such as is laid down by some authorities. The number of points deducted for any failure to come up to the ideal must be left to the discretion and experience of the judge.

A common method of examination of ears is to break them across to see the depth and character of grain. This is not necessary, and is sometimes misleading on account of some varieties of maize having chaffy cores which hide the real depth of the grain. The best method is to remove half a dozen or more grains from the centre of the ear with a pocket knife and examine them. In an exhibit of ten ears, each ear must be treated in this way and the grain compared. It will not do merely to take a large number of grains from one ear and score the characters of that ear for the whole sample. This latter method has been adopted by some commercial men in judging maize ears.

At an exhibition which occurs before the end of the growing season, it is recommended that the scoring for market or seed condition (dryness) of ears for seed should not be too drastic. For ears which are very wet, heavy deductions should, of course, be made, but seed-ears may and should be picked in the field before they are dead ripe and fit to shell, and they should not lose points heavily for not being in a dry condition.

Ears and grain should be examined in a good light for uniformity and shade of colour. It is often difficult to distinguish the grades of yellow which appear in white maize, and the lighter coloured or white caps which appear in yellow maize through cross-fertilisation between white and yellow varieties.

The removal of more than three or four grains from the ear should be looked on with suspicion, and deduction made for lack of uniformity, as they may have been removed to conceal badly shaped grains or evidence of crossing. The judge should also look for evidence of large amounts of cob trimmed off the tips to make them presentable. Such practices as "loading" the ears and "oiling" the grain are rarely seen nowadays.

In judging shelled maize in the bag, a "trier" should be used to get samples from different parts of the bag, or, if smaller quantities are exhibited, several handfuls should be brought up from the bottom and middle of the bag.

Suggested Classes for a Maize Schedule.

The following classes are suggested from which a selection may be made for the maize schedule at any show, according to what is regarded as most important for any particular locality. As previously explained, the exhibition of ears for seed should be kept separate from the exhibition of shelled grain for market:—

SECTION I.—Ears for Seed.

Class 1.—10 Ears of Large Yellow Dent Maize; any variety.
Class 2.—10 Ears of Medium Yellow Dent Maize; any variety.
Class 3.—10 Ears of Small Yellow Dent Maize; any variety.
Class 4.—10 Ears of Large White Dent Maize; any variety.
Class 5.—10 Ears of Medium White Dent Maize; any variety.
Class 6.—10 Ears of Small White Dent Maize; any variety.
Class 7.—10 Ears of Yellow Flint Maize; any variety.
Class 8.—10 Ears of Sweet Corn; any variety.
Class 9.—10 Ears of Pop Corn; any variety.
Class 10.—10 Ears of Specific variety.

SECTION II.—Shelled Grain for Market.

Class 11.—Bag of Large Yellow Dent; any variety.
Class 12.—Bag of Medium Yellow Dent; any variety.
Class 13.—Bag of Small Yellow Dent; any variety.
Class 14.—Bag of White Dent; any variety.

SECTION III.—Miscellaneous Classes.

Class 15.—10 Ears Shelling the Greatest Weight of Dry Grain.
Class 16.—10 Stalks of Maize for Green Fodder.
Class 17.—10 Stalks Shelling the highest *percentage* (not amount) of Grain per Stalk.
Class 18.—Best Boy Judge, under 18 years. (Boys to make awards, and to be judged on the correctness and *their reasons* for making such awards.)
Class 19.—Best Stalk or Stalks of Maize from which to Select Seed.

Class 10 is important as giving recognition to named varieties of maize, and is strongly recommended for encouragement by country show associations. Its inclusion in the schedule is a praiseworthy effort to improve the maize-growing industry in the district. The variety suggested is the one which is most popular and most largely grown in the district, and, if more than one variety is in favour and is suited to the district, there may be several classes of this nature providing for such varieties in addition to the general classes previously given, which would include other varieties not so well known in the locality. For a State exhibition as many of these classes should be made as there are well-known and adapted varieties in the State. The Royal Agricultural Society has introduced several classes for specific named varieties into their schedule, and many country associations have followed their lead.

For a State exhibition a 3-bushel bag of shelled grain should be shown, while for smaller country shows 1-bushel lots would be sufficient.

The factors to be considered in connection with Class 19 are: Height of stalk, height of ear on the stalk, number and size of ears on the stalk, length of shank, erectness or drooping of the ear at maturity (on which depends to some extent the protection from bird and weather damage), and the husk covering, which is most largely responsible for freedom from insect infestation in the field.

FLINT AND DENT VARIETIES OF MAIZE.

"WHAT are the advantages of flint maize over the other kinds?" asked a correspondent on the Central Tablelands, who last season grew two or three varieties that had been sent him by the Department, and had been interested in the behaviour of Canada Early Flint under the dry conditions that obtained.

"Flint maize has no advantage over the dent varieties we now have," ran the reply. "At one time it was considered much hardier and, of course, much earlier than most dent varieties, but this advantage has disappeared with the advent of early dent varieties like North-Western Dent, &c. These early dent varieties have the additional recommendation that the grain is not so hard, and is therefore far more suitable for feeding to stock."

The Packing of Fruit.

[Continued from page 576.]

W. J. ALLEN and W. LE GAY BRERETON.

Use of Chart Cards.—When fruit is truly packed according to a standard, the count can be placed on the case by reference to the chart, and there is no need for the packer to keep tally of the fruit as it is packed, or to make any calculation when the case is complete, which, of course, would be impracticable.

Before the case is nailed down one can tell from the top tier what pack it is (2–1, 2–2, 3–2, or 3–3), and what is the row-count. For instance, if it is 2–2 x 6–6 in the Australian bushel case, glance down the 2–2 column of the chart, and opposite the 6–6 row-count will be the total count, 144. This is quickly scratched on the end of the case with a lead pencil, so that after the case is nailed it can be put on with a stencil or rubber stamp, when all the stencilling is being done. If packing in returned cases for the local market, the count can be put on at once with chalk. If preferred, the nailer, instead of the packer, can put on the count, but, of course, it must be put on before the top tier is hidden with the lid. As a matter of fact, with a fairly even run of fruit only three or four counts will be used during a day, and a packer gets so familiar with these that he will hardly have to refer to the chart.

To render reference to the packing-house chart-card the more speedy, the number of columns should be reduced as far as possible. The chart for the Canadian case is given in this simplified form to serve as a sample. As it is not necessary for the packer to know the size of fruit for the various counts, the size column is eliminated, but if it is thought that a reference to the ranges of sizes that a pack takes is helpful, the largest and smallest of those ranges can be placed at the top over the row counts of the pack. As it is not necessary to repeat the pack before each count it need only be put in once clearly at the top. This leaves two columns only to each pack, the " row counts " and the " total counts."

If a large card is used, hung so that several packers can work from the one card, the figures should be from ¾ inch to 1 inch in length, and the card made out with a stencil or a rubber stamp. Fair spacing should be allowed between each row of figures, and a dividing line drawn between each row. The columns of each pack should be placed well apart with double lines between them. A smaller card made out with about ⅜-inch figures, and hung handy for each packer, may be preferable. This also has the advantage that a packer can scribble any note next to the count where the changes occur, for future reference.

Earlier in these articles it was stated that these changes would occur on different counts according to the shape of the variety, and it is well to make notes on separate cards for each, in the first season, of the main varieties as they are being handled. It will be found that more than one variety of the flat types will change on the same count, so that at the end of the season these can be grouped, and one card kept headed with names of the varieties that have the same changes. Jonathan, Dunn's, Rome Beauty, and London Pippin will generally change on the same counts, and one lot of cards marked on the top with these names will serve instead of having a separate card for each variety. As a matter of fact, the varieties named are not all similar in shape, and probably the same counts of each vary in height of spring, but they still come within the limits of the maximum and minimum heights of spring on the same counts.

It will be found that these reference notes on the chart are very rarely used, except just at the beginning of the packing season for each variety.

If any irregular pack is used, such as the four-tier 3–2, mentioned in the Canadian case, it should be placed on the chart, with its correct count opposite, and distinctly located, and to lessen chance of mistake the packer, and not the nailer, should certainly mark the count on such cases as soon as completed.

The injustice caused by marking a case with a higher count than its actual content is obvious, but a buyer would also have cause for complaint if, for instance, an eight-tier 3–2 were marked according to a seven-tier chart, for, though he would get a higher count than represented on the case, the fruit would be of smaller size than one should expect to get under the count represented.

If one insists on having the size also marked on the case it would be better to have a separate size chart for the stenciller, instead of loading up the packer's charts with an extra column. Such a chart would not need to have the packs separated, but just the counts in rotation in one column and the sizes (which had been previously determined for each main variety) opposite their respective counts. He could then mark the size on the case from the count.

Pears.—The numerical system can be used for packing pears, and the charts already given for the Australian and Canadian bushel cases respectively can be adhered to. Owing, however, to the shape of many pears, the degree of tightness to which each tier is drawn up is not so definite as with the apple, and if care is not taken more than the specified number of tiers for each pack in the chart will be obtained, thus rendering the numbering by the chart incorrect. Some pears—especially those of a long type with very little taper, such as the Vicar of Winkfield (Napoleon)—pack better if laid across the case with those forming the outside longitudinal rows with calyx towards the sides of the case, but the William, and other varieties of similar shape or more round type, are mostly packed longways with the case. The pears forming the first cross row are then placed with the calyx towards the end of the case nearest the packer. The remainder of the tier are reversed with the stalk nearest the packer, so that the tier will close with the tiers in the last cross row with the calyx towards the end farthest from the packer. Some packers prefer to continue the tier with the calyx towards the starting end, and reverse the tier forming the last cross row. This is purely a matter of choice, but it is important that the calyx of the pears forming both the first and last cross rows should point towards their respective ends of the case, as the shape of a pear will not allow of tight packing otherwise.

It may be pointed out that wherever this reversing occurs, except with very round types, less space is left between the fruit than in the remainder of the tier.

This can be overcome, though it is seldom found necessary, by reversing in different places in the succeeding tiers. For instance, reverse in the second cross row in the first tier, the third cross row in the second tier, the fourth cross row in the third tier, and so on.

Peaches.—Peaches handled in either of the bushel cases named can also be packed under the numerical system. The charts already given for those cases will apply, although it may be necessary to add counts to either end to accommodate some sizes, and the condition must also be borne in mind that the fruit must be firm enough to stand the pressure of a flexible top and bottom. In districts close to market some growers cater for a trade that requires peaches and other stone fruit in a more mature condition. In such instances a cleat must be used on the ends of the cases before nailing or tying down, to sufficiently relieve the pressure on the fruit, a similar principle applying if the tops and bottoms of the cases in use are not flexible.

Citrus Fruit.—Among our citrus growers there has been a decided prejudice against space packing, but this is probably due more to unfamiliarity with the methods than anything else. More than one of our big consignors adopted the system some years ago, and found it simple to operate, the fruit arriving satisfactorily and the buyers making no complaint as to its packing.

The orange and lemon are specially suited to this styles of packing. Tight-skinned mandarins can also be operated upon under the same system, but if mandarins are at all puffy they are not satisfactory, as they lose their shape, and the pack consequently loses its formation.

In a recent test at the Yanco Experiment Farm a small run of a rather oval type of Valencia Late oranges packed out as follows in the Canadian bushel case:—

2-2 Pack x 4 tiers.	3-2 Pack x 5 tiers.	3-3 Pack x 6 tiers.
5-5 = 80 6-5 = 88	5-4 = 113 5-5 = 125 6-5 = 138 6-6 = 150 7-6 = 163	6-5 = 198 6-6 = 216

The above run included all sizes from 2⅛ inch to 3¼ inch, maintaining ⅛-inch range. However, it is well to point out that this fruit was packed to a height suitable for export conditions, and allowing for the spring given by a truly flexible top and bottom. The fruit was also of an oval type. If a flat type orange is being packed the 2–2 pack could probably be employed by placing on the edge for at least one higher count (6–6 = 96), and the 3–2 would then start on the 5–5 = 125, or the 6–5 = 138 count, and would be employed as far as the 8–8 = 200 count. This would reduce the height of the spring or bulge of the packs, which would be an advantage for the local market in working with the case with the hinged lid, which allows for very little spring top or bottom. The Australian bushel case is used to a small extent for oranges, and if used the chart already given for that case can be adhered to.

The lemon, as a rule, packs closer in the tier if placed stalk end towards the side of the case, and this can be taken advantage of in the higher counts of each pack, which is liable to run low, to help to keep them up, in a similar manner to that in which closed and open packing is used, as already explained, for apples.

Half-cases.—The flat half-case (18 inches long, 11¾ inches wide, 5¼ inches deep), which is largely used for peaches and other stone fruits, is too shallow as ordinarily made up to allow a uniform space pack to be adopted. At the orchard at Glen Innes Experiment Farm this case was preferred by buyers on some of the country markets, both for stone fruits and apples. The cases were not returned from these markets, and it was found that by having them made up with 11¾-inch depth and 5¼-inch width, a uniform space pack could be adopted. In addition to the advantage that the numerical system can be adhered to, there is the recommendation that the spring comes on the two narrow sides, which are really the top and bottom as packed, and as the most convenient way to stack is on the flat, no pressure comes on the spring or bulge. In the ordinary make-up of the case—that is, with 11¾-inch width and 5¼-inch depth—unless it is packed just level, which is not practicable in all instances, the weight when stacked comes directly on the fruit.

A disadvantage in the case made up in the narrow way is the cramped space for working, although a packer will get used to this after a little time. Another drawback, also due to the narrow width, is that only two packs can be used, that is, the 1–1 with five tiers for the largest fruit, the 2–1 with six tiers for the smaller, and then, as the width will not allow a 2–2 for the still smaller, the 2–1 with seven tiers has to be adopted. The defects of using one pack with two different numbers of tiers in one system has already been pointed out. With peaches this is not found a very great inconvenience, because there is no overlapping. For instance, in Elbertas the following charts were used:—

1-1 Pack x 5 tiers.	2-1 Pack x 6 tiers.	2-1 Pack x 7 tiers.
5–6 = 55	4–4 = 72	5–5 = 105
6–5 = 60	5–4 = 81	6–5 = 116
7–6 = 65		

It is seen from this that when the row counts became greater than 5–4 there were seven instead of six tiers, so that with ordinary care there was no danger of marking a six-tier 2–1 from a seven-tier 2–1 chart, though the change from six to seven tiers might take place on another count with a variety of a different shape.

With flat fruit an overlapping sometimes occurs, as will be seen from the following instance in packing Rome Beauty apples:—

2–1 pack x 6 tiers,
5–5 open = 90,
6–6 closed = 108,
7–6 closed = 117.

The next size would not come high enough packed 2–1 x 7–7 closed in six tiers, but it came too high closed in seven tiers. When packed 2–1 open, it gave a row count of 6–6, and came up in seven tiers. It is obvious this overlapping would be liable to lead to errors when marking from the chart. The open pack with flat fruit is sometimes obtained by placing the fruit calyx towards the sides of the case.

Though all details have not yet been worked out, it is probable that a uniform space pack will be possible for the half-case of 18 inches by 7⅛ inches by 8⅜ inches.

This half-case, made up with 7⅛-inch width and 8⅜-inch depth, has been adopted entirely at Yanco Experiment Farm as the half-case for packing peaches. It has been found a superior package to the flat half-case for peaches, and last season uniform space packing was used for the whole of the season's pack.

(*To be continued.*)

GOVERNMENT ASSISTANCE TO CO-OPERATION IN ENGLAND.

THE extent to which the British Government is assisting the cause of co-operation in England is indicated by the grants that are being made by the Government. According to a paragraph in the *Journal of the Board of Agriculture,* April, 1919, grants amounting to about £31,000 were made from various sources during 1918-19 to the Agricultural Organisation Society, an institution with which most of the farmers' co-operative societies in England are associated, and that exists to assist and advise the societies and generally to advance co-operation. The grants came from the Development Fund, the Food Production Department, and the Small Holdings Account, and the increasing importance attached to the work is indicated by the fact that the grants in the previous year were £15,420—less than half.

The Feeding Value of Sudan Grass.

G. G. St. CLAIR POTTS, H.D.A., H.D.D., Assistant Inspector of Agriculture.

THE feeding value of Sudan grass was made the subject of special inquiry in the course of trials conducted on the Murrumbidgee Irrigation Areas last summer, and it was thought that an analysis of the grass as grown under our own conditions would be of interest. Accordingly samples were forwarded to Mr. F. B. Guthrie, Chemist, who supplied the particulars that follow. An analysis of Japanese millet was obtained at the same time, and is given in order to enable comparisons to be made.

—	Sudan Grass.				Japanese Millet.
	Suitable for Grazing 2 feet high.	Ears Peeping.	In Flower.	Advanced Seed Stage.	Ears Peeping.
	As Green Fodder.				
Moisture	78·77	51·18	34·34	21·07	55·35
Albuminoids	3·47	7·25	7·75	4·50	5·95
Ether Extract (fat) ...	·79	1·22	·92	·62	1·04
Ash	3·54	5·16	6·28	6·76	6·44
Fibre	5·49	14·36	22·77	27·08	13·27
Carbohydrates	7·94	20·83	27·94	39·97	17·95
	100·00	100·00	100·00	100·00	100·00
Albuminoid Ratio ...	1 to 2·8	1 to 3·2	1 to 3·9	1 to 9·1	1 to 3·4
Nutritive Value ..	13·18	30·8	37·7	45·8	26·2
	As Dry Matter.				
Albuminoids	16·37	14·86	11·80	5·71	13·32
Ether Extract	3·72	2·49	1·40	·79	2·33
Ash	16·66	10·56	9·56	8·54	14·43
Fibre	25·86	29·42	34·69	34·32	29·72
Carbohydrates	37·39	42·67	42·55	50·64	40·20
	100·00	100·00	100·00	100·00	100·00

The albuminoid ratio is of vital importance in compounding a ration for stock, and in this connection Sudan grass compares favourably with Hungarian or Japanese millet, and is superior to most of the grasses, including *Paspalum dilatatum,* Rhodes grass, green maize and sorghum.

The palatability of Sudan grass cannot be questioned, as all classes of stock eat it readily, whilst judging from the way sheep fatten, cattle increase their milk-flow, and horses work when fed on it, it must be exceedingly digestible—a quality that deserves consideration in feeding.

The grazing stage supplies the narrowest albuminoid ratio and this quality broadens as the grass matures until the advanced seed stage is reached. At this period of growth the albuminoid ratio is too broad for a well-balanced ration, and some legume or concentrated food must be added to supply the necessary proportion of protein to carbohydrates.

Some Actual Results at Yanco.

Trials with Sudan grass as a grazing crop were conducted on several farms at Leeton last year, in connection with the farmers' experiment plots, and the particulars given in the general report will be found interesting in that connection, especially those in reference to Farms 178 and 138. On Mr. A. H. McDonald's Farm 151 the feeding value of Sudan for milking cows was compared with that of paspalum, which is largely used for dairying on the areas. The milk and butter yields from twenty-eight cows, which had been grazing on the paspalum, were carefully tested just before being transferred to the Sudan grass. A fortnight later their milk was tested again, with the results given below.

The Sudan grass was in the advanced seed stage when grazed, and it is considered that higher returns would have been obtained if it had been grazed earlier. It was noticed that the cattle showed a strong partiality for the seed heads, systematically eating these before touching the stalk or flag growth.

MILK and Butter Returns from twenty-eight cows after grazing on *Paspalum dilatatum* and Sudan grass respectively.

	Milk.		Butter-fat Test.	Milk per day.	Butter-fat per milking.	Butter-fat per day.	Commercial Butter per milking.	Commercial Butter per day.
	Morning.	Evening.						
	lb.	lb.	per cent.	lb.	lb.	lb.	lb.	lb.
Paspalum dilatatum ..	312	....	4·4	....	13·73	....	16·16	....
,, ,, ..	....	206	5·0	518	10·30	24·03	12·15	28·31
Sudan Grass	338	....	4·6	....	15·55	....	18·31	....
,, ,, ...	....	236	5·8	574	12·69	28·24	16·19	34·50

The above shows an increase of 56 lb. milk and 4·21 lb. butter-fat, or 6·19 lb. commercial butter per day when grazed on Sudan grass after *Paspalum dilatatum*—a substantial increase. Casual observation seemed to indicate that the conditions were quite normal at the time of both tests, but it is considered advisable, before conclusions are definitely drawn, to conduct further trials and tests, and arrangements are being made to that end for the coming season.

SUDAN GRASS IN THE WEST.

To a West Wyalong farmer who proposed sowing Sudan grass on red soil of a fairly light nature with a clay subsoil about 10 to 12 inches from the surface, but who desired to be sure, first, that he had a prospect of success. Mr. E. Breakwell, Agrostologist, replied that the soil described would suit admirably. In that district it should be sown about October at 6 lb. to 8 lb. per acre, in drills 1 foot 9 inches apart, using every third hopper in the wheat drill. The addition of 1 cwt. of superphosphate per acre would be beneficial. The seed should approximate 9d. per lb. in price.

The Cultivation of the Vineyard.

H. E. LAFFER, Viticultural Expert.

To the viticulturist, cultivation is one of the most important operations in the year—in fact, it may be said that in common with the pruning it determines the success or failure of the enterprise. In the great majority of cases, vineyards that are highly productive would be worthless, commercially, under a system that did not aim at efficiency in this respect. Instances might be cited where, for experimental purposes, vineyards have been paved with concrete, with the exception of a small portion around the stems of the vines, making cultivation impossible, and yet the vines have flourished, the reason being that the concrete prevents the evaporation of moisture from the soil. The same applies to vines growing against buildings, the soil in which the root systems flourish being protected from excessive evaporation by the buildings.

These, however, are very different conditions to those of vineyards under normal conditions of culture, where the soil surface is exposed to evaporation in every form.

In a state of nature, a plant grows and fruits, and is often short-lived. Following its natural course, the fructification is mainly confined to the development of the seed as a means of perpetuation of its kind, and those qualities which we demand in commercial fruit—development of pulp and accumulation of sugar—are totally neglected.

In periods of ample rainfall the development is greater and the production heavier, while in dry seasons the plants protect themselves by shedding a portion of their fruit or by the non-development of the pulp. Under cultivation, the aim is to secure uniformity of moisture from year to year, and in conjunction with scientific pruning to supply the vines with a reserve of energy which goes to the development of high quality fruit.

Systematic cultivation aims at the absorption by the soil of the maximum quantity of moisture throughout the rainfall period of the year, and the conservation of that moisture during the dry and hot months when the fruit is developing and maturing. Incidentally, it results in aeration of the soil, assists in the breaking-up of complex compounds into simpler and soluble elements of plant food through the agency of atmospheric and soil gases, and also brings about the destruction of weeds. This last is of much moment, of course, for no matter how great the amount of moisture stored in the soil, a profuse crop of weeds very rapidly wastes the greater part by drawing it from the soil and subsoil, and transpiring it through the leaves and stems. Absence of weeds throughout the growing period of the vine also materially diminishes the possibilities involved in the attacks of various insect pests. It is a well-established fact that the damage done by insects such as cutworms and the Rutherglen bug is always greater in weed-infested vineyards. This is natural, for weeds in any form not only afford shelter and food for the young insects, but also provide protection from the grower's remedial measures against the adults. Briefly, the operations of cultivation may be divided into winter, spring and summer, each in its own period demanding care and attention to detail.

Winter Cultivation.

All the operations pertaining to the working of a vineyard throughout the summer have a tendency towards the consolidation of the soil immediately below the surface. This is accentuated by early autumn rains and by the growth of weeds incidental to such rains. In such a condition, accumulated water is quickly shed from the surface, and more particularly so if the land has any appreciable fall. Winter cultivation aims at enabling the soil to absorb moisture and preventing "run off," and a broken, loose condition is therefore produced. Naturally, the rougher and more open the surface, the more easily does the water find lodgment, and the more certainly reach the subsoil. In the early winter cultivation, destruction of weeds is purely secondary, although it is very largely effected.

Under normal circumstances, the earlier the winter ploughing can be started the better. In most viticultural districts the conditions generally admit of the ploughs being started in May, all that is required being sufficient rain to moisten the soil, in order that the ploughs may readily break it up. Where small areas are concerned it is a simple matter, but with large vineyards the work has to be started early in order that it may be completed in good time. The nature of the soil has to be considered, and the ploughing so arranged that the most difficult portions are completed first. Heavy soils should, in most cases, be completed before they become too wet, while lighter ones may safely be left until later, as they may be ploughed at almost any time.

The system of ploughing varies in different districts and according to local custom, but it should be accepted as an axiom that the lower the average rainfall the greater the care that should be put into cultivation. Efficient work aims at complete turning of every portion of the surface at least twice a year.

The system generally recommended is as follows:—So soon as the land is in a fit condition for ploughing during the month of May or early in June, open out a furrow down the centre of the row to a depth of 6 inches. Return with the plough running in the bottom of the same furrow and held in such a position as to throw a furrow out on the other side. This is the process known as "opening out," and when complete it leaves a wide, deep furrow or channel down the centre of each row. Into this, two furrows are now thrown in order to form a crown, with the plough still set to 6 inches. The subsequent furrows are then turned on to this crown until the row of vines is reached upon either side. It is not always advisable to plough deeply right up to the vines, owing to the possibility of severing important roots or even pulling the vine out of position. It is preferable to turn the last furrows with a lighter finishing plough. Implements are obtainable that are so constructed that the body is set over from the beam, which is at the same time movable and can be set right out to allow the horse to walk wide of the row. In this way there is very little left unploughed—simply a small strip against the vines, which is easily treated by means of a hoe. This last operation may be accomplished by hand, or by a specially constructed implement known as the "vine hoe," which carries a hoe or blade out upon an arm so that when guided by the steering disc on the near side, it can be worked around the stems of the vines with ease, turning one-half of the unploughed strip on either side. When the whole work has been completed the soil is high in the middle of the rows, while the vines stand in the depression and are therefore more likely to get the benefit of any rain that falls. The uneven and rough surface meets, in an ideal manner, the requirements mentioned above.

The soil is permitted to remain in this condition throughout the winter or until such a time as it may be desirable to push on with the further cultivation. Pruning and other work will be completed in the meantime.

The Object of Spring Cultivation.

Operations connected with spring cultivation have for their objective the reduction of the surface to a more even and level condition in the first place, and the complete destruction of any weeds that have sprung up during the winter. First of all, the ploughing is reversed, the initial furrows being thrown on to the stems of the vines. As the primary object of the winter ploughing has been achieved, it is no longer necessary to cut too deeply, and therefore a uniform depth of 4 inches will be ample, and will serve to bury weeds and level the surface. The final furrow is turned in the centre of the row, leaving but a shallow finish, which disappears with subsequent working.

It is wise to throw back the first furrows before the vines burst, as otherwise there is a risk of doing some damage to young growth. On the other hand, if the work is done with a plough constructed for the purpose there is little danger, even though the growth be some inches in length. In dealing with large areas, the simplest plan is to throw back these first furrows if possible before the vines burst, and the balance can be dealt with later on. Completion of this second ploughing leaves the surface in a loose and fairly level condition, preparatory to the commencement of the summer cultivation.

An Alternative Winter Treatment.

A system differing from the foregoing is preferred in some localities, principally in districts of heavy winter rainfall. In such districts it is considered preferable to complete pruning operations and have cuttings cleared up before the surface is broken, as these operations are then more easily carried out. More especially is this so when the cuttings are destroyed by means of a travelling burner, the rough condition of freshly-ploughed land creating difficulty in drawing the burner over the surface. Following upon the completion of these operations, and the greater part of the winter rain having fallen, a start is made with the ploughing. In such a district the necessity for conserving the maximum amount of the rainfall may not be so great as in other districts, the average precipitation being favourable to the vigneron. There is a danger, too, of serious washing away if the land is broken prior to the wet season, especially if the land is hilly.

The method of procedure differs from that already described, in so far that only one ploughing is given instead of two. Under normal conditions there will be a heavy growth of weeds to be dealt with, and possibly these may create some difficulty. Even so, by the use of a dragging chain attached to the plough heavy growth can be turned under, which will constitute valuable organic manure.

One objection to this system lies in the fact that the whole surface is not turned each year, and therefore it is not recommended for the drier districts. The first furrows are thrown against a row of vines, and working around this row as a centre the finish takes place against the two adjoining rows. Thus, when the ploughing is complete, we have alternate rows in which the soil has been thrown on to the vine stems, while the remainder stand in narrow unploughed strips. According to custom, these strips may be either dug with the fork or spade or simply chopped down with a hoe. The former is the better plan, though it entails a considerable amount of labour. In the following year the ploughing is reversed, so that those rows which are dug or hoed in any one year have the soil ploughed on to them the following season.

Subsequent to the ploughing, the other implements are kept working for the purpose of reducing the surface to a fine tilth, and in all respects these operations agree with the general spring and summer treatment.

Spring and Summer Cultivation.

Whereas the primary object of winter ploughing is to ensure absorption of moisture, the aim and end of the subsequent operations of the season are to conserve that moisture over the longest possible period. It seeks to ensure uniformity of supply throughout the time when the vine is developing and maturing its fruit and wood. The efficacy of good cultivation in this respect is readily demonstrated by noting the rapidity with which an untilled soil loses its moisture in the summer, and comparing it with the moist condition of the soil just below the top layer of loose earth in a vineyard that is properly cared for. The subsoil of well-cultivated land (be it fallow for wheat, or planted to maize, or carrying fruit trees or vines) will remain moist through protracted periods of dry weather.

In setting about surface cultivation, the usual plan, if the soil is fairly rough, is to break it down in the first instance with a set of heavy harrows. This prepares the way for one or other form of the common vineyard scarifiers or horse-hoes. The former, of which there are various types, usually imply the use of two horses. They are light in their structure, but adapted to tearing into the soil to a good depth. The horse-hoe type is worked with the aid of one horse, and is specially suited for working close up to the vines, or in narrow rows where a larger team is out of the question.

The first object of this working is to reduce the roughly-ploughed soil to an even surface, to break down lumps, and to destroy young weed growth by exposing their roots to the air. No hard-and-fast rule can be laid down as to the amount of working needed, because it is dependent upon many factors, such as the nature of the soil and the frequency of rain. In any circumstance, the scarifying should be continued until the desired condition of surface has been secured. All classes of implements used in the various operations are so adapted that the tines or shares are interchangeable. For preliminary working a long narrow one is used to tear and break down the surface, but at a later stage a broad, flat sweep is preferable for weed destruction.

Assuming that the lumpy, uneven condition of the soil has been overcome, any future working is largely determined by the summer rainfall. Once the surface is reduced to a fine even tilth, free from weeds, there is no occasion to continue stirring the soil, provided no rain falls. The particles of the soil will retain their loose and divided condition for some considerable period, checking capillary action and therefore practically limiting evaporation to that occasioned by the actual heat of tne soil under summer conditions. As there are no weeds growing, losses in this direction are eliminated.

So soon, however, as a rain falls the effect is to consolidate the surface, bringing the soil particles into close unison and therefore immediately setting up conditions favourable to capillary movement of the soil moisture. Then comes the necessity for further cultivation as early as possible, with a view to loosening the soil once more and thus preventing evaporation and to destroying the crop of summer weeds that will be germinated by the moist conditions. Hence we may find that in some seasons no great amount of cultivation is needed once the soil has been worked down, while in other years it may be necessary to continue the work throughout the season, almost without intermission.

In any case, even without much rain the soil becomes more or less consolidated in the course of time and certain hardy weeds grow, notwithstanding dry weather, and it is therefore advisable to re-cultivate at desirable intervals.

A certain amount of work there always is that cannot be accomplished by horse implements, and that has to be done by hand, but by utilising the right class of implement manual labour can be reduced to a minimum. It is mainly concerned with the removal of large or inaccessible weeds that cannot be rooted out with the implements. In a very large measure the necessity or otherwise of any great amount of hand labour is determined by the efficiency of the general cultivation. In other words, the best plan is to prevent weed growth by destroying it while young.

The soil, then, is maintained in good condition throughout the summer, and in due course the crop matures and is cut from the vines. But this does not imply that the requirements of the vines are entirely satisfied and that nothing further is needed for the season. As a matter of fact, it now becomes imperative that wood shall be matured for the succeeding season. To this end the soil should be maintained in as favourable a state as possible. Vintage operations consolidate the surface more or less, and when they are completed it is well to resume the cultural operations as soon as possible. As the season advances there is not the same need for cultivation, for the reason that the days will be shorter and the temperatures less severe. Even so, in many well-kept vineyards it is the practice to keep the soil loose right up to the commencement of the first ploughing. This will be found advantageous in dry seasons, because of the greater ease with which ploughing is accomplished. A well-cultivated soil will plough in comparatively dry conditions, whereas a neglected and consolidated one will require considerable rain before it can be broken up again satisfactorily.

However, clean autumn cultivation is not the unadulterated blessing it might be considered, nor is it so generally practised as it was at one time. On the contrary, many experienced vignerons encourage autumn growth of weeds and herbage because of their value if ploughed in as green manure.

In any case, when rainfall and climate combine in the autumn to encourage the growth of herbage, it is coming time to consider the question of starting the winter ploughing once more. Where the spacing of the rows will permit the sowing of green manure crops the matter must receive attention during the autumn, but this aspect of viticulture will be reviewed at a later date.

VINEYARD NOTES FOR SEPTEMBER.

VINES will be breaking into active growth once again, and every precaution should be taken to assure continuous and strong development of wood. Unfortunately, the winter rainfall has been disappointing in many cases, but it must be hoped that there will be a good fall in the near future. In the meantime thorough cultivation will enable the existing soil moisture to be conserved to the best advantage.

Spring and summer rain will no doubt encourage fungoid diseases, and therefore close watch must be kept for black spot, downy mildew and oidium. Vignerons will be well advised to take no risks and to be prepared, at any rate to the extent of having supplies of bluestone, lime and sulphur on hand for emergency. Precautionary sprayings are wise until there is some plain indication of the nature of the season. They take but little time and material when growth is small, but they may mean the saving of the season's crop should showery weather prevail.

Plantings of young vines should have been completed, although this operation has been delayed by the absence of rain.

In some places, notably the Irrigation Areas, there are indications of a caterpillar plague which will do a good deal of damage to vines. The early brood has been feeding upon herbage and maturing during the past month. They will most likely reappear in great numbers during October, and will then feed upon the vines. Spraying affected plants with 1 lb. arsenate of lead to 7 gallons of water will prove destructive to the small caterpillars. Another good remedy consists of one part of Paris green mixed with 50 parts of flour. The mixture is dusted upon the leaves of the plants, which should be slightly damp. In either case, the poison is taken with the food and the caterpillars are killed.—H. E. LAFFER, Viticultural Expert.

The Lantana Fly.

(*Agromyza lantanæ.*)

W. W. FROGGATT, F.L.S., Government Entomologist.

As a general rule the lantanas do not invade virgin forest or brush land, but once they start they soon take possession of all open land or cleared paddocks that have been neglected and overrun with weeds and other shrubs. This has taken place wherever certain species have been casually introduced into a new country with a suitable climate, as in the Hawaiian Islands, Fiji, New Caledonia, and the coastal districts of New South Wales and Queensland. The particular lantana with which we are familiar here was probably introduced into Australia at a very early date. Many years ago it had spread over the Hawaiian Islands, and in 1901 Professor Koebele went to Mexico for the Hawaiian Sugar Planters' Association to investigate the natural enemies of the plant, where he collected a number of different insects infesting these shrubs, and took them to Honolulu. They were described by Perkins in the *Hawaiian Planters' Monthly* (vol. xxi, December, 1902). In the following year, under the heading "Enemies of Lantana," he recorded that they had successfully established seven distinct species of Mexican insects that were attacking the lantana bushes growing in the vicinity of Honolulu, though he did not particularly note the lantana fly. In 1907, when the writer visited the Hawaiian Islands, he was shown a leaf-mining fly, a gall-making fly, and a defoliating leaf bug which were destroying the lantana foliage. Later on it was found that the most effective of the seven introduced insects was the lantana fly, whose larvæ fed upon the berries and seeds, causing them to fall before they matured, and it was recorded as the effective parasite that checked the further development of the lantana scrub by destroying the seeds. It is from these colonies of seed parasites in the neighbourhood of Honolulu that the collectors from New Caledonia and Fiji obtained their specimens for liberation in their respective islands. The latest importation to the mainland of Australia was when the Queensland Government introduced these parasites into that State to deal with the lantana.

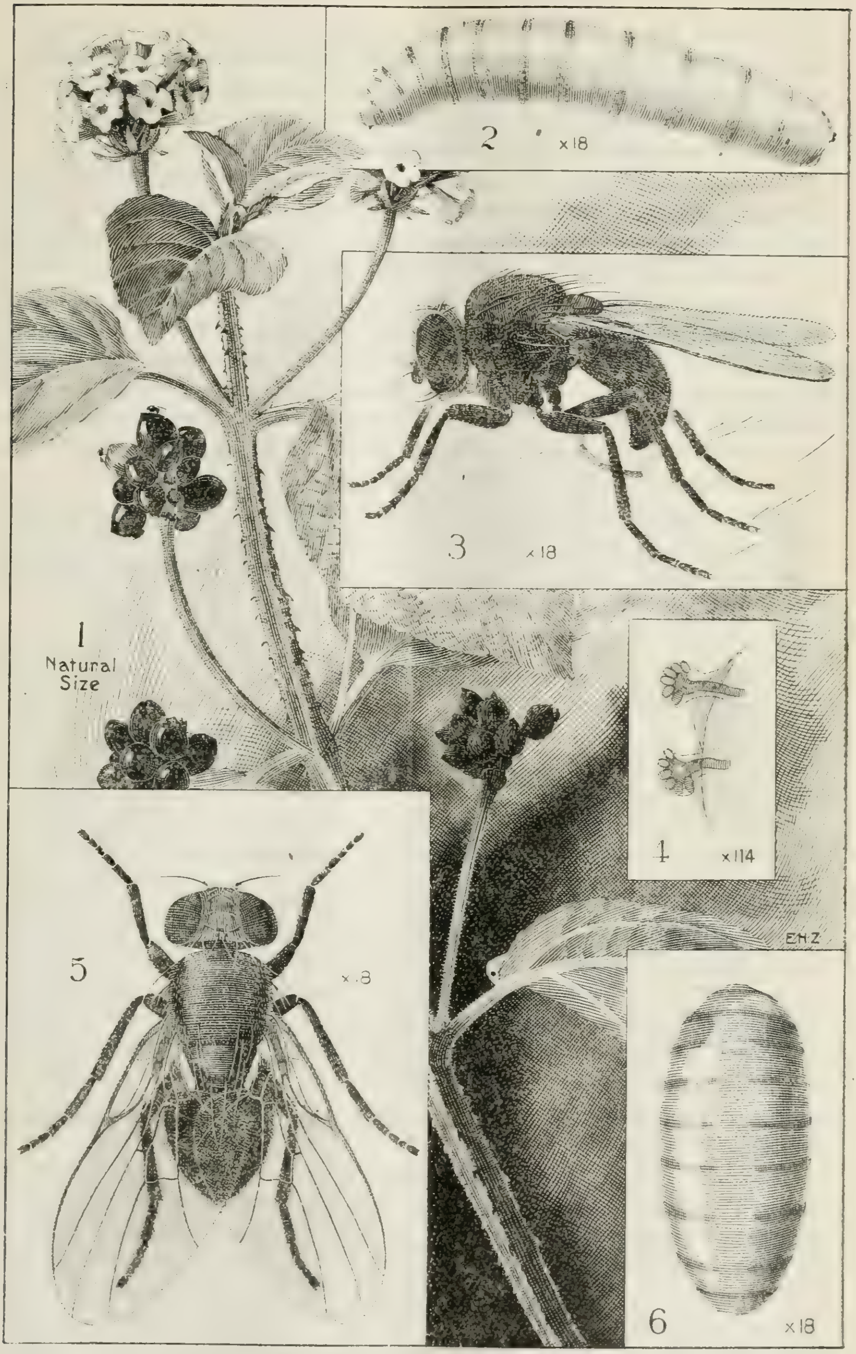
During the last ten years many inquiries have been made by residents in the lantana-infested areas on the Tweed and Richmond Rivers, asking if the Department of Agriculture would obtain and distribute lantana flies in New South Wales, but the introduction of phytophagus (plant-eating) insects of any kind from foreign countries is a much more serious matter than appears on the surface, and it should be carefully studied from all points of view by a competent economic entomologist before it is sanctioned. The writer has pointed this out on many occasions, and has shown that an insect may be perfectly harmless to the vegetation in its native land, but when introduced into a different climate, with a new and more varied flora, and without any natural control, it may very easily increase in such numbers that its host plant will be deserted for any allied vegetation useful or otherwise. The cure will then be worse than the disease. Thus a plant-eating insect from a tropical country like Mexico might even be normal in isolated tropical islands like Fiji, New Caledonia and Hawaii, but when it came to the eastern coast of Australia, with its varied introduced fruits and native flora, it might become a very different proposition. For these reasons the writer has always refused to recommend the Department of Agriculture to introduce lantana flies, pointing out, in addition to the foregoing, that the introduction of lantana flies would not kill out the existing lantana scrub, which would eventually have to be rooted out, even if the flies did destroy a large percentage of the seeds.

We have no record that the lantana fly has ever been artificially introduced into New South Wales, and it was not until early last May that the existence of the true lantana fly or a closely-allied species was recorded in this State.

At that date, Mr. M. S. Barnett, Colonial Sugar Company, who is interested in insects infesting sugar-cane and sugar lands, brought to the writer a number of lantana fruits containing dipterous larvæ, pupæ, and a perfect fly that had just emerged. These had been collected by a member of their chemist's staff (Mr. D. L. McBryde), from bushes growing in the neighbourhood of Middle Harbour and Rose Bay. Later observations have shown that in many localities in the vicinity of Sydney sometimes 10 per cent. of the immature berries are infested by these fly larvæ. Since then Mr. McBryde, who has been visiting the Tweed River district, has written to the general manager of the Colonial Sugar Company a letter from which the following is extracted:—

> A general examination has been made on this river on both hill and river flat country, with the following results:—
>
> The fly was found to be well established throughout all districts, damaging the majority of lantana seed, and no doubt greatly checking the spread of this pest plant. The damage, while it is widespread, was found to be heaviest in sheltered swampy areas and lightest in open spaces exposed to the full force of the wind. While the fly seems to do best in sheltered places, it seems to favour sunny rather than very shady areas, and the damage done to the seeds of the lantana growing among scrub is not as heavy as where it gets more sunlight. There is little doubt that this fly has been established here for at least several years, as it is so plentiful and widespread, yet it does not seem to be able to keep the spread of the lantana entirely within bounds. This plant is to be found all over the surrounding country, often growing so thickly that it has taken entire possession of large tracts of land. While the check, however, is not by any means complete, there can be little doubt that it is of very considerable importance. My recollections of the lantana on the Richmond River ten years ago are that it bore very heavy crops of fruits, and that these berries reached maturity without any insect damage.

It would be interesting to have observations made over the Richmond and Clarence River districts to see if the lantana flies are present there. The damage can be easily noticed on the green and ripening berries, by the brownish marks upon the otherwise healthy fruits, and the larva can be easily seen in such fruits by cutting away the skin and splitting the seed.



The Lantana Fly (*Agromyza lantanæ*).

1. Spray of lantana showing berries and foliage. 2. Larva of lantana fly. 3. Side view of lantana fly. 4. The breathing spiracles. 5. Dorsal view of the lantana fly. 6. Pupa of lantana fly.

The active flies lay their eggs in the immature berries, and the maggots produced from the eggs feed upon the pulp, but afterwards enter the seed, eat out the centre, and pupate in the cavity; sometimes, however, they do not enter the seed, pupating on the outside of it in the pulp, but in every case they destroy the fertility of the seed.

The larva is a typical white maggot, with distinct transverse bands marking the segmental divisions, with retractile jaws and anal tubercules. The pale-yellow oval pupa usually occupies the whole of the cavity in the shell of the seed, after the larva has eaten out the contents.

The perfect fly is of a uniform black colour with slight yellow marks on the back at the insertion of the wings; the large eyes dull red, the whole body and legs covered with fine hairs or bristles, with several large ones on the upper and under surface of the head, and scattered large recurved bristles on the dorsal surface of the thorax. The wings are semi-transparent with rich iridescent colours in some lights, and the nervures are black. Length from front of head to tip of folded wing 3½ mm.

As the writer has been unable to compare the New South Wales specimens of the lantana fly with those in Hawaii, its determination is doubtful, but from a superficial examination it agrees with that of the species originally described as *Agromyza lantanæ*.

Work in the Apiary.

W. A. GOODACRE, Senior Apiary Inspector.

BEFORE making an attempt to examine a colony see that the smoker is capable of giving a good volume of smoke; then hold the smoker in one hand, slightly lift the rear portion of the cover with the other and deliver a few puffs of smoke over the top of the frames. Do not be in a hurry to have the cover right off; wait a few seconds and give another puff of smoke; then the cover may be removed. Watch the bees, and if they become excited give a little more smoke along the top bars, not (as many do) by placing the nozzle of the smoker in the frame space, for this method usually gives punishment to the bees that do not intend to give trouble.

To examine the combs, place the smoker in a convenient place, such as between the knees, and note the frame that can be drawn without trouble or jarring, for any rough manipulation will excite the bees. If the bees appear to become excited at any time during inspection, that is, by making a rush to the top bar and looking as if about to make a charge, one puff of smoke in time will save nine and also a few stings. In this way there will be less punishment for the bees. Very little smoke is necessary in most cases, if the apiarist will take notice of the excited movements of the bees.

Examination of the Combs.

When examining a frame, always hold it in a vertical position, for nothing looks worse in this work than to see a person making an examination by holding the frame flat, so that the unripe honey drips about the hive. The comb will often be damaged by careless handling owing to the extra strain placed upon it.

When shaking bees off, place the thumb and first finger of each hand over the top bar at the joint of the side bar, and grasp the side bar firmly. Then place the second finger of each hand under the projecting portion of the top bar. This will give support to practically the whole frame. Do not hold the frame too high from the ground, and, in ordinary work, shake the bees near the entrance. There should be some convenience by which the young bees can travel from the ground to the entrance. It is a good sign when we see an apiarist having consideration for the baby bees, for it shows that he has the necessary love for his little friends.

Removing and Replacing Supers.

When preparing to remove supers, it is best to have an empty body and bottom board placed in a convenient manner near the hive. Then see that the smoker is alight, and place the hive tool under the corner of the super to be removed. The most convenient place will be the right-hand front corner. Prize the super up nearly half an inch, deliver a few small puffs of smoke and, after a few seconds, grasp the hand-hold with the left hand. Any frames that happen to be attached with burr comb can now be eased down gently with the hive tool and the super can then be removed and placed on the empty body.

During the operation the smoker should be in a convenient place in case the bees at any time become excited. Before replacing the super it is best to remove any burr comb, then place the super so that all corners of the under super, or body, are well clear, taking care to avoid crushing the bees. All that is necessary now is to twist the super into its correct place, at the same time watching the movement of the bees, and again avoiding crushing them.

Many apiarists are very careless in this work, and it is not uncommon to see dozens of bees crushed between the bodies of the hives—the result only of carelessness and lack of consideration.

GRAFTING.

BENCH grafting can be carried on this month. Top grafting of undesirable varieties can also be carried on in such cases where the sap is flowing freely enough. Some of the late apples in the tableland districts may not be ready until October.

Buds put in during last season should be watched; shoots from the stock that might sap them should be either rubbed off or pinched back, and when growth from the bud is long enough they should be tied as a safeguard against their being blown out.—W. J. ALLEN.

Poultry Notes.

SEPTEMBER.

JAMES HADLINGTON, Poultry Expert.

DURING the past month poultry-farmers appear to have made an effort to overtake some of the leeway in the hatchings noted last month, and big crops of chickens are now to be seen on most farms.

There is little doubt that the notion that August and September hatched pullets are the best layers has been a contributing factor to some of the deferred hatchings, but the fallacy of that policy will be seen when next April and May come round, and stud stock is required, whether for use on the farm or for sale. It is perfectly true that August and September are the months in which the largest percentage of autumn and winter layers are hatched, but these months are just a little late to produce stock fit to breed from early the following year. The cockerels of the later hatchings are also worth considerably less as table poultry than the June and July hatched birds, which is some set-off to other factors.

Then, again, it is almost impossible for the farmer who has to hatch a large number of chickens to crowd all his hatching into two months, and it is much better, as big operators will find, to spread the hatching over the months of June to September inclusive. There are but few farms with the equipment necessary for rearing all the chickens required in two months. and attempts to hatch all the chickens required in so short a time must inevitably result in overcrowding and general congestion of the chicken-rearing plant.

One of the faults of many farms is too great an incubating capacity for the brooding accommodation, and under such circumstances it often occurs that good hatches prove a curse instead of a blessing. This and next month will reveal many cases of this kind, and the lesson should be heeded in view of hatching season next year, for in poultry-farming, as in other things, experience is the best, if the hardest, master.

Overcrowding. What is it?

It is found that among beginners, and among many whose experience should have supplied the answer to this question, there is a general lack of precise knowledge as to what constitutes overcrowding. It may be of advantage to define what is considered fairly safe practice in regard to the number of chickens to run together in a given brooder space.

If we take as an example a sectional brooder unit having a floor space of 8 square feet, the following may be laid down as the number of chickens it might contain from time to time as they grow, and also the temperatures for the various ages. The table sets out the method in operation at Hawkesbury Agricultural College, and at practically all Government-controlled farms, including soldiers' settlements, and also on many successful commercial farms:—

Age of Chickens.	No. of Chickens.	Temperature. (Bulb of Thermometer 2 inches from floor.)
First Week	100	90 degrees Fahrenheit.
Second and Third Weeks	75	86 to 82 degrees ,,
Fourth and Fifth ,,	60	82 to 76 ,, ,,
Sixth Week	40	Little beyond natural heat.

After the sixth week the birds should be transferred to rearing pens, the floor space of which should be 8 feet x 6 feet.

The number of chicks mentioned in the above table should be regarded as the maximum, and preferably ten chickens less should be carried in each case. The temperatures shown are the minima of safety. Standardisation in both these respects, and also in feeding, would do much to put chicken-rearing on a sound basis.

Feeding.*

The following is the method of feeding recommended for the various stages from chicken to adult:—

1. Chickens coming from the incubators are fasted during the first thirty-six to forty-eight hours.
2. Then fed for two days on dry rolled oats.
3. From that time up to six weeks of age they receive:—
   (*a*) Moist mash (four feeds per day): One-third bran, two-thirds pollard, mixed with hot skim-milk, if procurable. One oz. of fine salt dissolved in water to every 5 lb. of meal.
   (*b*) Chicken mixture (one feed per day): Ground wheat, 20 lb.; ground maize, 13 lb.; kibbled or hulled oats, 7 lb.; bone meal, 3 lb.; hemp seed, 2 lb. Nutritive ratio of the above is, approximately, 1 to 5.
   Green feed is given each day at midday after the chickens are one week old.
4. From 6 to 12 weeks old:—
   (*a*) Moist mash as above (three feeds per day).
   (*b*) Wheat and cracked maize (one feed per day): Two-thirds wheat, one-third cracked maize. Nutritive ratio of the above is, approximately, 1 to 5.
5. From 12 to 24 weeks old:—
   (*a*) Moist mash (two feeds per day): Pollard, 60 lb.; bran, 20 lb.; lucerne dust, 12 lb.; meatmeal, 8 lb.; common salt, 22 oz. The salt should be dissolved in water before mixing with the mash.
   (*b*) Wheat and cracked maize (one feed per day): Two-thirds wheat, one-third cracked maize. Nutritive ratio of the above is, approximately, 1 to 4·5.
   The grain mixture is always fed as the evening meal.

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*Note.—This matter was published in the "Poultry Notes" in October, 1918, but it is repeated now on account of the number of the applications for the information.

Mixing Mash for Chickens.—The method of mixing the food for chickens is as follows:—Take the proportion of bran, say, about one-third, place it in a bucket or other receptacle, then pour over it as much milk or other liquid as will allow of about two parts of the pollard to be absorbed by it, working the whole into a crumbly mash. Should the pollard be finer than the average, up to half bran may be used. There is little or no objection to the use of that quantity of bran, because in food value there is so little difference as not to make any material alteration in the nutritive ratio or value.

Milk for Chickens.

The value of milk for chickens is generally recognised, but it is perhaps not so well understood that when fed in conjunction with other foods it has a value far beyond what its chemical constituents would indicate. Milk is of great value as a liquid with which to mix the soft food.

Many operators give their chickens milk to drink. This may work well enough with small lots run with hens, but it is most objectionable and dangerous when large numbers are run together in heated brooders, or where they have to crowd together for warmth. Milk cannot be given to chickens to drink without their down and feathers becoming besmeared with it, and an insanitary condition is thus created which is likely to encourage disease—in fact, to bring on the very condition that one often sees sour milk recommended to cure, namely, diarrhœa.

Under no circumstances should milk form the only liquid given to chickens to drink. Water should always be available to them in addition.

Parasites of Chickens.

A sharp lookout should now be kept for the appearance of suck louse on the heads of chickens. When chickens appear to be dull and peaky, with drooping wings, for no apparent reason, the presence of this parasite may be suspected, and a thorough examination of the head, throat and neck should be made, particularly the top of the head. If the infestation is in the early stages, probably nothing but what appears to be a mass of nits will be found, but the more mature insects, rarely exceeding a sixteenth of an inch in length, and somewhat narrow, are of a dark grey colour, and may be mistaken for the sheaths and "buds" of small feathers. They are not easily detected, but a ready way of showing them up is to moisten a piece of flannel very slightly with kerosene and hold it on the head of one of the chickens for a second or two, when the lice will withdraw and show themselves. If one chicken in a lot is found to be infested, it may safely be assumed that all are more or less so. To destroy this parasite, all that is necessary is a little salad oil applied to the head and throat of the chicken; but this should be done as lightly as possible, because if oil or grease of any kind is applied heavily to the "down" on chickens it is calculated to cause more deaths than the parasite. It will probably be necessary to repeat the application in eight or ten days' time.

Kerosene or mercurial ointments are dangerous to use, and there is no necessity to employ them for this parasite. The salad oil is quite effective by itself.

Orchard Notes.

SEPTEMBER.

W. J. ALLEN and W. LE GAY BRERETON.

Spraying.

IN some of the early districts the early blossoming apples and pears will be ready this month for the first of the spring sprays for the control of black spot of apple and pear and other fungus diseases. Either lime-sulphur or Bordeaux mixture can be applied when the spurs are bursting and the enclosed clusters of fruit buds are partially exposed. After a dry season, in which black spot was not prevalent, many are tempted to miss this application; but should the spring prove favourable to the disease in districts that are liable to attack, it will get a footing if the spray is missed, and later applications will prove only partially effective. The better plan in districts that are liable to this disease is to make this first application of the fungicide, and if the season turns dry to cut out or reduce the later applications. Moreover, there are decided indications that where this first spray is carried out consistently every season, the accumulation of the disease is checked, and the disease can then be kept within reasonable limits even during seasons favourable to it; on the other hand, if it is neglected during seasons not too favourable to the development of the fungus, the loss may not be so great, but the disease accumulates so that it is impossible to control it when seasons come that are favourable to its increase.

For several years lime-sulphur was tested at various strengths as a summer spray in the orchards at the experiment farms, and the dilutions given in the bulletin entitled "Spraying" proved safe over and over again on apples and pears in the tableland districts. However, a couple of seasons ago damage from the use of this spray was reported from more than one source, and last season experiments were again conducted by the Department at Glen Innes and Bathurst orchards, and also at Penrose and Batlow. Bathurst and Penrose reported no damage from the use of lime-sulphur; Glen Innes reported some thinning of the crop. Batlow at first reported decided thinning, but later it was considered that it was only a hastening of the natural shedding and that the final setting of the crop was not affected. In the three first-named places, Bordeaux mixture caused far more loss from severe russeting of the fruit than lime-sulphur; at Batlow russeting from Bordeaux mixture occurred, though not so severely; and though Bordeaux mixture may be a more efficient fungicide, the Department still considers lime-sulphur the safer summer spray to use for apples and pears on the tablelands for the disease mentioned.

The warnings given in the bulletin regarding the delicacy of certain varieties of apples and pears should be observed. In the dry inland climates the risk from black spot of apples and pears is so slight that it is not necessary to spray as a safeguard against this disease.

The first fungicide application for control of mildew should be made at the same time as that for black spot. As it is impracticable to make two separate applications—one of a fungicide for black spot and another for mildew—experiments were conducted last year to ascertain whether iron sulphide could be combined with Bordeaux mixture or lime-sulphur. Of course, the results of one year are not sufficient to justify conclusions, but the test last season indicates that the combination is safe. At Bathurst orchard a better control of mildew was given when one or other of the above combinations was used than when iron sulphide was used alone.

The continued use of iron sulphide at Glen Innes orchard during an abnormally dry season checked the growth of both trees and apples to a serious degree. This had not been noticeable in previous experiments with iron sulphide spray on apples. It may be mentioned that atomic sulphur again gave a good control over mildew, and had no retarding effect on either the trees or fruit.

Though grape vines last season were mostly very free from black spot of the vine, it would be most unwise to omit the swabbing with sulphuric acid or sulphuric acid and sulphate of iron; this treatment is the first line of defence and delays the outbreak of black spot should the spring turn out favourable to the disease. The swab can be used up to the time when the buds are well swollen.

Emperor mandarin trees will be fit to receive their first application of Bordeaux mixture for brown spot early this month.

The first application of lead arsenate for codlin moth should be made when most of the petals have fallen, and before the calyx is closed. In most districts the majority of varieties will not be ready till next month, but in some parts of the coast certain varieties, such as Carrington, are often ready in September. Particulars that are of interest to growers in this connection are given in the accompanying table.

TABLE showing weight of various brands of lead arsenate paste to be taken in order that the resulting mixture shall contain as much dry lead arsenate as is equivalent to "18 oz. of arsenate of lead in the dry state to each 50 gallons of water."

Brand.	Weight to be taken.		Brand.	Weight to be taken.	
	lb.	oz.		lb.	oz.
Swift's	2	0	**Hemmingway**	2	0
Electro	1	11	**Sherwin Williams**	2	6
Foster's	2	11	**Lewis Berger**	2	0
Blue Bell	2	2	**Federal**	2	3
Red Seal	4	3	**Austral**	1	9
Nichol's or Our Jack	1	14	**Carlton**	2	5
Platypus	3	6	**Vallo**	1	14
Orchard	2	2			

A careful lookout should be kept for black or green aphis on peach, nectarine or Japanese plums, and if any be detected, the trees should be sprayed at once with either tobacco wash or nicotine extract. To cope with this pest the trees should receive a thorough drenching, and if any live aphis be showing, a second thorough application should be made not more than three days after the first.

If woolly aphis is showing on apple trees, tobacco wash can be combined with the lime-sulphur fungicide or with the arsenate of lead spray before mentioned. Some extracts of nicotine can be used in the same way.

Some growers, although they have efficient power spray outfits, fail to get nearly the output per day the machines are capable of. Some hints on carrying out this work expeditiously were published in the *Gazette* in September, 1917.

Cultivation.

In all cases the orchard should be reduced to a condition in which it will retain moisture, as the future crop depends largely on the state in which the soil is kept during the summer months. If it was not possible to plough the soil at the proper season, the work should be put through immediately.

Around all trees and vines the soil should be loosened with either a fork hoe or a chipping hoe, and all couch grass, sorrel or other weeds should be removed and burnt. This work should be carried out in the early spring, before they can become instrumental in the loss of soil moisture.

For Citrus Growers.

It is usually advantageous to give land on which citrus trees are growing a good soaking three to four weeks before the blooms burst. This, with liberal applications of manure, usually ensures a good setting of fruit.

Citrus trees should receive an annual thinning out. Dead wood and old worn-out and dying shoots throughout the body of the tree should be removed.

Where the ground is moist and in good condition, planting of citrus can be proceeded with in districts where frosts are finished. In most of the inland districts it would be better to wait till next month. Care should be taken that the land is not allowed to dry out after the planting.

Budding.

Wherever the sap is running freely and the bark lifts easily, this work should be pushed on amongst the young citrus stocks. In re-working an old tree it is well to put in plenty of buds, so that if a few do not take there will be enough left from which to start the new top. The bud should always be inserted about where it is desired to have a branch. This will ensure a well-formed tree, which should carry some fruit the second year.

As soon as it is discernible which buds have taken, the branch may be cut back. It will be found that the buds will soon make a growth, and they will then need to be tied to a stake in order to prevent them being blown off.

Agricultural Bureau of New South Wales.

The Objects of the Bureau.

THE objects of the Bureau are to gather information respecting crops, best method of cultivation, improvement in breeding, feeding and care of farm animals, and the marketing of all products; also the prevention of the introduction and spread of insect, fungus and other pests, and the improvement educationally and socially of rural conditions.

The Government will subsidise branches at the rate of 10s. in the £ (pound) on membership fees; an annual subscription of not less than 2s. and not more than 5s. per member should be sufficient for all requirements.

Regular monthly meetings should be held, and matters of local and general interest discussed. Whenever possible an expert from the Agricultural Department will be present to lecture or demonstrate.

Any farmer who finds there is no branch in his district should communicate with the Department, with a view to steps being taken to form one.

Mr. L. S. Harrison, of the Field Branch, has been detailed to take up the work of organising the Bureau, and renewed activity is looked for now that officers of the Department are returning from active service.

Suggested Subjects for Bureau Meetings.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion :—

In view of the possibility of wheaten hay crops being very light and of supplementary fodder crops becoming necessary, what crop do you think might be sown in your district? Would maize be suitable; if not, what other crop could be used with advantage? Some growers have found that where maize has been sown in the spring and cultivated through the summer, the land has carried a better crop the following year than bare fallow; have you had such an experience and what is your explanation?

At what age do you break in farm horses? Do you think it profitable in the long run to put them to heavy work while quite young, or do you prefer to wait a little to ensure greater physical development? Describe the method of breaking in that you adopt. Have you any reason to believe that the temperament of the older horse used in breaking in has any influence on the temperament of the youngster?

What fertilisers, if any, do you use for maize crops? Have you tried mixing bonedust and superphosphate in equal quantities? Have you observed any advantage from increasing one or the other of these two manures according to the character of the soil? What effect have you found manuring to have upon the time of maturity, and is that effect desirable in your district?

Of the various brands of lead arsenate on the market, which has given you the best results? In the later applications of this spray have you tried a *spreader, and, if so, has the result been any more effective? What nozzle do you use with the lead arsenate, especially for the first application?*

Have you tested lime-sulphur and Bordeaux mixture for controlling black spot of apples and pears, and which has been the more satisfactory? Give a reason for your preference.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse the opinions expressed.

Bimbaya.

The annual meeting of the branch was held on 17th July. The financial statement showed a credit balance of £4 3s. 4d., and the secretary's report indicated that the year's operations had been profitable to members.

The election of officers resulted thus:—Chairman, Mr. G. Alcock; Vice-Chairmen, Messrs. F. Ramsey and L. L. Heffernan; Hon. Secretary and Treasurer, Mr. J. R. Boller.

During the evening a paper was read by Mr. E. H. FILMER on the subject of herd-testing, and whether it should be made compulsory. A lengthy discussion followed. The majority of members, although strongly favouring some practical system of herd-testing, were opposed to compulsion, although several contended that much of the progress in the dairying industry has been brought about by this means. A scheme embracing a number of districts and employing a paid tester, the farmers to take their own samples, was generally favoured. It was stated that the farmers could, after a little instruction, take samples with almost perfect accuracy. Several speakers favoured a small testing outfit on every farm. It was contended that from 15 to 20 per cent. of cows on district farms were not showing any profit on the feed they consumed, and their owners would be much better off without them.

The subject set down for discussion at the next meeting is "Mr. Massy-Greene's Scheme for organising the Dairying Industry."

Coraki.

The annual meeting of this branch was held on 17th July, when several new members were enrolled. The annual report indicated that this comprised the fifth year of the branch's work, and that several useful meetings had been held. The balance-sheet disclosed a credit of £2 5s. 3d. The election of officers resulted thus:—Chairman, Mr. Hodge; Vice-Chairmen, Messrs. C. Blackwood and H. N. Campbell; Hon. Secretary and Treasurer, Mr. Forrest; Auditor, Mr. J. Storey, junior.

Coradgery.

A meeting of this branch was held on 18th June, when Mr. W. E. Tayler read the following valuable paper:—

ARTIFICIAL FEEDING OF SHEEP IN DROUGHT.

During the recent prolonged and—in this district—unprecedented drought, practically everyone in our neighbourhood fed his sheep for several months, and generally succeeded in pulling them through with comparatively little loss. We were all considerably handicapped by having no water on our properties, thus being compelled to cart it from the train. The most successful were those who faced the situation quickly, and fed their sheep before they lost condition.

Good results were obtained by feeding on wheat alone; more with wheat and hay; but the best of all feeds tried was undoubtedly ensilage, especially for lambing ewes, and it proved infinitely cheaper than anything else.

One of our members was very successful in lambing his ewes on ensilage plus also a little wheat. The ewes are now in splendid condition and have an excellent crop of healthy lambs. Their owner was wise and far-seeing enough to have a large pit of ensilage on hand, and started to feed his ewes on it a fortnight before lambing commenced. The result is a most useful object lesson to the district.

I myself have been feeding on Adavale since January on ensilage, wheat and hay, and although, unfortunately, I had insufficient of the first-named to see me completely through the whole five months of distress, I had enough to keep the sheep healthy, and enable me to finish up when the drought broke with fewer losses than in normal times and with all the animals in good condition.

Let us first deal with the question: Does it pay to feed? Personally, I have no hesitation in answering it in the affirmative. In the 1902 drought it was questionable, as sheep were then worth about 10s. per head as against 30s. to 40s. now.

One could spend double their 1902 value on feeding them to-day and then be 50 per cent. to 75 per cent. to the good. This being so, and second grade wheat being obtainable in large quantities at a reasonable price, many more people fed during the recent drought than in 1902. This—not the greater severity of the 1902 drought—accounts for the greater loss in that year than recently.

The questions now arise, what have we learnt from our recent experience to enable us to face the next inevitable drought, and what can we do to prepare ourselves to fight it in the most economical way? Let me first review the various feeds. I am not going to deal with lucerne or maize (both excellent feed for sheep) as they are not grown in this district, and can only be procured in dry periods at ruinous prices.

Those we can grow and store ourselves are ensilage, wheat, oats, wheaten and oaten hay. As already stated, ensilage is decidedly the best sheep-feed, and has been proved by the Government experiment farm at Coonamble and by many others to be quite efficient for lambing ewes.

Wheat alone will undoubtedly keep sheep strong, especially when some dry grain is available, and dry sheep will do excellently on wheat with wheaten or oaten hay. I have had no experience on feeding on oats, but have no doubt they would take the place of wheat quite well.

Next comes the question of cost. I know from experience we can grow a crop of wheat or oats and pit it as ensilage at a cost not exceeding 10s. per ton. Once in the pit it is immune from fire, rain or pests; no insurance is required, and there is no deterioration. To grow wheat, keep it for, say, twelve months, and allow for destruction and waste by mice, &c., cannot be calculated at less than a cost of 4s. 6d. per bushel. Hay kept for one or two years, with insurance and waste allowed for, can be valued at £3 per ton easily. If we work on these figures for feeding 1,000 sheep per day, we will arrive at something like the following:—

	£	s.	d.
Ensilage.—			
1½ tons at 10s. per ton	0	15	0
Labour of feeding	0	10	0
	£1	5	0
Wheat (grain and hay).—			
4 bushels of wheat at 4s. 6d....	0	18	0
15 cwt. of hay at 3s.	2	5	0
Labour of feeding	0	10	0
	£3	13	0
Wheat (grain).—			
8 bushels at 4s. 6d.	1	16	0
Labour of feeding	0	5	0
	£2	1	0

These figures show conclusively that ensilage is much the cheapest feed, and I think I have estimated the cost value of both wheat and hay at moderate prices. At a time when sheep have to be fed, the latter is generally approaching nearly double the price I have taken it at. I am absolutely sure that ensilage is the most suitable and most economical feed for all descriptions of sheep in times of drought, and farmers should conserve, not necessarily in one year, at least 100 tons (£50 worth) per 1,000 sheep; those who do so will be able to feed at a most reasonable cost for seventy-five days. A wise man will double the 100 tons, and will not consider the cost excessive, regarding it as an insurance premium on £1,500 to £2,000 worth of sheep.

It is important to recognise that if hand-feeding is to be successful it must be started before the sheep lose condition, and feed must be put out regularly about the same time every day in each paddock. Those who allow their sheep to go till they are about to die before they begin to feed, will find that they will surely lose the cost of their feed and their sheep as well.

The suggestion that the Government should buy and store fodder so that it can be obtained at reasonable prices during droughts, is a good one. It seems quite practicable, and should prove the means of preventing the enormous losses of the past, and at the same time help the growers of hay and cereals considerably. Farmers would grow all the fodder required for their stock if they were assured of a payable price as soon as it was grown. At any rate, it seems to be the unanimous opinion that the only means of meeting the huge taxation now necessary, is to increase the production of our primary industries, and to do that something must be done to prevent the appalling loss of sheep and cattle that occurs during droughts.

Discussion.—A useful discussion followed, it being conceded that nothing for the purpose of fodder conservation came up to ensilage. Mr. G. **Tanswell** stated that he fed sheep on ensilage in which black oats predominated, and his sheep picked out everything else but would not touch the black oats. Several members stated that they had used wheat and had found it good as long as the sheep had something else to feed on as a bulk feed. The main difficulty with wheat was in feeding it during and after wet weather, the sheep tramping the grain into the ground.

Departmental Note.—The Chief Inspector of Agriculture comments that the experience at the experiment farms at Nyngan, Trangie, Condobolin and Coonamble was the same as Mr. Tayler's, whose comparison of the costs of feeding is confirmed by our own results. His remarks in regard to the keeping qualities of silage as compared with hay are worthy of special note. Silage pits can be made on the farm at a cost not exceeding 2s. 6d. per ton capacity, whereas to successfully store hay for several years it would be necessary to construct sheds, costing about £2 per ton capacity.

Cordeaux-Goondarin.

At a meeting held on 23rd May, Mr. H. E. Cowain, Chairman, read a paper, in which were made some interesting suggestions on pruning.

Mr. **Cowain** considered that in starting young trees care should be taken to remove any broken roots and to trim other long roots back. The head should be cut back to balance the root. After three years, if the trees were not cut too hard, they would begin to throw out light laterals which should be encouraged unless too long or not suitably placed, in which case they should be shortened back in the early summer. On no account would he allow any strong growth to take place about the leaders, as it tended to weaken the leader above, and no fruit spurs would develop either above or below. Of apples, Jonathan, Granny Smith, London Pippin (Five Crown), and Alfreston were among the easiest to handle, though Jonathan required to be pruned regularly. Rome Beauty was a little more difficult to manage, and he recommended summer pruning in preference to winter pruning in its case. Other features of the paper were also suggestive and appreciated by members.

Eulomogo.

Mr. J. H. Stinson read a paper on drought-resistant grasses and plants at a meeting of this branch on 7th July.

Mr. **Stinson** particularly advocated the use of Sudan grass, stating that it will soon be universally known and grown; it survived the severe weather of last summer where it was grown in western districts and even produced good feed. He had seen a 3-acre plot of it at Cobar 18 inches high in December last, the seed having been sown in October in moist ground, but having had only 10 points of rain during growth. Several other grasses, such as Rhodes grass, Coolah grass, Warrego summer grass, &c., also promised well as protective against periods of drought. He also intended to try saltbush, having had encouraging reports in regard to it in dry districts.

Garra-Pinecliff.

A pruning demonstration was given in connection with this branch by Mr. W. le G. Brereton, Assistant Fruit Expert, on 8th August. The attendance was very satisfactory, and the demonstration indicated how various kinds of fruit trees should be treated.

Lidcombe.

Mr. J. Peckham gave a demonstration of pruning and propagation of fruit trees on 16th June. He said he preferred to raise his own yearling trees, and demonstrated how this should be done. The meeting proved an interesting and profitable one.

On 14th July a paper was read on potato-growing by Mr. H. Laman, who traced the history of the potato from the time of its discovery in South America, indicating how numerous varieties had arisen, and how susceptible the potato is to differences in soil and climate. The selection of the seed should be carried out with particular care, and all inferior tubers shunned, irrespective of the price. In appearance, the seed should be even in growth, regular in form, clean in the skin, true to colour and type as regards variety, and with the eyes well up to the surface.

A further meeting was held on 28th July, when the attendance was very good. A paper on the cultivation of vegetables was read by Mr. H. Lawrence. He especially discussed the varieties of different vegetables which his own experience suggested as the most suitable for the district, and the paper provoked a lengthy and useful discussion.

Lower Portland.

At the monthly meeting on 8th July Mr. F. Herps read a paper on pea culture, in which he strongly advocated the thorough preparation of the soil, the plants being of a shallow-rooting habit, and a good depth of worked soil being therefore necessary. As to manure, he had found the results from cowyard manure and bonedust very satisfactory. In the course of the discussion which followed, valuable suggestions were made by several members and visitors.

Moss Vale.

The monthly meeting of this branch took place on 13th June, the attendance being large. The business was a paper by Mr. R. N. Makin, Inspector of Agriculture.

STRAWBERRY CULTURE.

In choosing a locality a good sunny spot is best, as, though the strawberry is naturally a shade-loving plant, it is freer from disease when grown in the sun and the fruit ripens more evenly. Good drainage is essential, and a good friable soil with clay subsoil is most suitable, as the clay retains the moisture well. Some varieties like a stiff soil and others a sandy loam.

It is very necessary to have a good supply of humus in the soil. This may be provided by growing a green crop of field peas, rape, mustard, oats, &c., and ploughing it under some time before planting the strawberries. Where time will not permit of this being done, a good dressing of well-rotted stable manure or cowyard manure should be applied before planting. The use of nitrogenous manures, such as dried blood, &c., is not advisable, as they promote too much leaf growth. Superphosphate and bonedust in equal parts give good results, and about 2 cwt. of this mixture per acre applied before planting and 1 cwt. per acre when the plants are beginning to flower give a good vigorous growth. Lime is not a manure, but most soils benefit by a dressing; it checks slugs, snails and other pests, and makes available plant food that is lying dormant in the soil.

In planting out a large patch it is best to put in varieties known to do well in the locality. Creswell's Seedling, Margaret and Luxton's Noble did well on the coast. Phenomenal and Melba were good varieties, with large, good-coloured berries. The present-day demand is for large, good-coloured fruit. Some varieties resist disease better than others, and this should be remembered when making a selection.

To give plants a good start, have the soil in good condition and well supplied with moisture. March and April is about the right time for planting for main crop. Planted in rows 3 feet apart and 2 feet between the plants, 7,260 plants are required to the acre, but the double row system of planting will be found most convenient. When planting, trim the roots of young plants, form a little hill for each plant in the drill, and then cover with soil, but do not plant too deeply (the crown should be on a level with the ground). The strawberry is a surface feeder, and this should be remembered when applying manure and cultivating the soil. The surface should be stirred often to retain the moisture, but do not cultivate deeply or too close to the plants. A supply of moisture at the right time is essential to heavy cropping, and the plants respond well to irrigation.

The prospects for the industry are good, there being a large demand for the fruit for table purposes, soft drinks and jams and preserves. Some fine fruit has been produced in this district. The fruit should be picked carefully by the stem and packed as attractively as possible.

Narellan.

A pruning demonstration was conducted by Mr. W. le G. Brereton under the auspices of this branch.

The system recommended was to cut the trees to a suitable number of leaders with practically no topping, after the lower framework of the tree had been well built with stout limbs, and provided, of course, it was still making strong growth. After the tree had given up this strong growth, topping might have to be resorted to again. The effect of the proper handling of the tree along these lines and regular renewal of the fruit-carrying wood, would be the prolongation of the life of the tree and the improvement of the quality of the fruit. The importance of pruning on correct lines at the very beginning was emphasised, particularly in the case of stone fruits, as after the trees had matured it was only possible to alter the method of pruning at the expense of a crop of fruit.

Springside.

The monthly meeting of this branch was held on 8th July, when Mr. P. Powley read a paper on the management of horses on the farm, from which the following paragraphs are taken:—

In my opinion those with a heavy body and legs of a light character are the most suitable for farm work, as in this kind you have strength and activity combined, and they stand the work on loose ground much better than the heavier legged and slower ones.

One of the first considerations is to see that your animal receives a sufficient supply of good, clean food. A mistake is made by some farmers in sending all their good fodder to market and rationing their horses on the residue and rubbish. These farmers are endowed with the "get rich quick idea." In connection with diet, it must be remembered that a good supply of clean, fresh water, of which the horse consumes a large quantity, is necessary. On no account should the water be of a stagnant nature, because in stagnant pools lie the sources of many diseases. On no account, either, should the animals be allowed to drink when in a hot or sweating condition. If they do go to water, leave the bits in their mouths to prevent them drinking too quickly. A liberal supply of salt is always acceptable, and should be in a convenient position for the horses to lick; this is necessary for the general upkeep of their health. It is as well to administer once or twice a year a pint of linseed oil, together with a teaspoonful of turpentine—an excellent mixture for ridding their intestines of worms.

The quantity of food to be allowed to the draught horse should be about three kerosene buckets of Algerian oaten chaff; as a good all-round food it cannot be surpassed. Another matter of importance is grooming. This should be done at least once a day, as a good combing and brushing removes the accumulated sweat and dirt and tones up the skin.

Stratford.

The monthly meeting was held on 12th July, when a discussion took place on calf-rearing. A good deal of interest was taken in the point as to the quantity and character of the harder feeds that might be supplied to a calf after it was 2 or 3 weeks old. Most of the members were agreed that the calf should run with the cow for a few days, and that thereafter new milk might be mixed with separated milk before the ration was reduced to skim-milk only. Several farmers advocated the separate feeding of each calf.

DEPARTMENTAL NOTE.—The Herdmaster states that if it is desired to grow calves well, it is advisable, after 3 weeks old, to give them, in addition to grazing, a little dry feed composed of good chaff, bran and crushed oats.

Wellington.

The annual meeting of this branch took place on 17th June. The report showed a credit balance of £1 12s. 6d. Discussing the work of the past twelve months, it was agreed that useful meetings had been held. The election of officers resulted thus:—Chairman, Mr. R. G. Harvey; Vice-Chairman, Mr. F. A. Kenyon; Treasurer, Mr. C. Kimbell; and Hon. Secretary, Mr. L. Jurd.

A paper was read by Mr. H. Broome on deep draining and root pruning, in which he described the movements of the moisture in the soil, and pointed out the necessity for avoiding the accumulation of stagnant water that would interfere with healthy growth of plants.

On 15th July the members listened to a paper by Mr. Jurd on the production of citrus fruits, of which a fair quantity is produced in the district. The paper provoked a very useful discussion.

A pruning demonstration was conducted by Mr. Swan, Fruit Inspector, at Curra Creek on the morning of 23rd July, and at Wellington on the same afternoon. Methods of pruning apples, pears, stone fruits and grape vines were demonstrated to a considerable number of growers, who were particularly interested to observe in one of the orchards the results of the methods adopted by Mr. Brereton last season.

Woonona.

The monthly meeting was held on 8th July, when a paper read by Mr. L. Brown on poultry subjects provided matter for discussion. The question asked in the June *Gazette* with regard to the best month for hatching was also discussed with advantage to all present.

On the subject of combating diseases in the orchard, which was also considered, it was agreed that all prunings should be destroyed by fire directly after pruning, and that the spraying programme recommended by the Department should be fully carried out to ensure best results.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	A. Buchhorn, Albury.
Baan Baa	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bankstown	J. W. Cunningham, Brancourt avenue, Bankstown.
Bathurst	J. McIntyre, Orton Park.
Batlow	A. C. Arnot, Batlow.
Beckom	H. Horsburg, Beckom.
Bimbaya	J. B. Boller, Tantawanglo.
Blacktown	B. H. Lalor, P.O., Seven Hills.
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Borambil	H. A. D. Crossman, "Homewood," Quirindi.
Braidwood	A. Page, Braidwood.
Brocklesby	J. Hunter, Brocklesby.
Buckaroo	P. J. Crowley, Buckaroo.
Bungalong	G. H. Pereira, Grenfell Rd., via Cowra.
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Cardiff	John Cockburn, Cardiff.
Carlingford	F. H. Harvey, Ray Road, Epping.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Clovass	W. G. Cox, Tatham.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Rowcliff, Cow Plain, Collie.
Comboyne	J. J. Dolton, Comboyne.
Coonabarabran	H. H. Moss, Coonabarabran.
Coradgery	M. J. Kelk, Back Trundle Road, Parkes.
Coraki	G. A. Forrest, Coraki.
Cordeaux-Goondarin.	G. H. Walker, Upper Crown street, Wollongong.
Coreen-Burraja	—
Corowa	R. Dwyer, Corowa.
Cotta Walla	T. A. Howard, Cotta Walla, Crookwell.
Crudine	F. W. Clarke, Crudine.
Cumnock	K. J. Abernethy, Cumnock.
Cundletown	S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla.	J. D. Berney, Eurimbla, via Cumnock.
Cunningham	B. J. Stocks, Linden Hills, P.O., Cunningham.
Deniliquin	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	Geo. Turvey, Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Eulomogo	J. H. Stinson; Eulomogo.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook	W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	W. Thompson, Forest Ck., Frogmore
Garra & Pinecliff	S. W. Packham, "Clifton," Pinecliff.
Gerringong	J. Miller, Warrabank, Toolijooa.
Glenorie	J. Hutchinson, Cattai Rd., Glenorie.
Grenfell	A. A. Patterson (*pro tem.*), Grenfell.
Gunning	E. H. Turner, Gunning.
Hay	F. Headon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
Hillston	M. Knechtli, Hillston.
Holbrook	Frank F. Forster, Holbrook.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jilliby-Dooralong	K. A. Smith, Jilliby, Wyong.
Jindabyne	Sylvester Kennedy, Jindabyne.
Keepit (Manilla)	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	J. M. Firth, Kellyville.
Kyogle	J. Martin, Kyogle.
Leech's Gully	James Donnelly, Leech's Gully.
Leeton	W. J. Monfries, Farm 521, Leeton.
Lidcombe	H. Laman, Martin-st., Lidcombe.
Lisarow	A. L. Kelman, Lisarow.
Little Plain	F. S. Stening, Little Plain, via Inverell.
Lower Portland	W. C. Gambrill, Lower Portland.
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham	A. E. Caldwell, Erina.
Meadow Flat	T. L Williams, Meadow Flat, via Rydal.
Middle Dural	A. F. Best, "Elliceleigh," Dural.
Milbrulong	F. W. Gollasch (*pro tem.*), Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Miranda	A. C. Wigzell, Sutherland.
Mittagong	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya
Moss Vale	W. G. Bale, Moss Vale.
Narellan	G. J. Richardson, Narellan.
Narrandera	James Faulkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville	W. J. Angilley, Orangeville, The Oaks.
Orchard Hills (Penrith).	K. Basedow, Orchard Hills, via Penrith.
Parkesbourne	S. W. McAlister, Parkesbourne.
Peak Hill	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	C. Aye, Penrose.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue)	E. Miskle, P.O., Lue.
Quaker's Hill	C. Gardner, Blacktown.
Rawsonville	G. R. J. Hovenden, Rawsonville.
Redbank	J. J. Cunningham, Redbank, Laggan.
Ringwood	Wm. Tait, Ringwood.
Robert's Creek	J. W. Morrissey, Robert's Creek.
St. Marys	W. Morris, Queen-st., St. Marys.
Sackville	Arthur Manning, Sackville.
Sherwood	J. E. Davis, Sherwood.
Speedwell (W. Wyalong).	B. Noonan, Speedwell, W Wyalong
Spencer	H. J. Woodbury, Spencer.
Springside (via Orange).	W. P. Scarr, Springside.
Stockinbingal	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Stratford	P. H. Deards, "Loch Maree," Stratford.
Tallawang	Selwyn E. Hinder, Tallawang.
Tallong	W. Snushall, Tallong.
Tangmangaroo	A. Thompson, Kangiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, "Chacewater," Chellington, Temora.
Tennyson (North Richmond).	H. C. Croft, Kurrajong.
Thyra-Bunaloo	C. H. M. Smith (*pro tem.*), Thyra, via Moama.
Tingha	M. L. Levitt, Tingha.
Toronto	J. Froome, Knowle Farm, Toronto.
Ulan	P. S. D. Howarth, Ulan, near Mudgee.
United Peel Riv. (Woolomin).	C. J. MacRae, Woolomin.
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	E. Crouch, "Estella," Wagga.
Walla Walla	H. Smith, Walla Walla.
Wallendbeen	W. J. Cartright, Wallendbeen.
Walli	C. T. Allen, Walli.
Warner's Bay and District.	J. Raw, Fairfax-st., Spiers' Point.
Wellington	L. Jurd, Warne-st., Wellington.
Wetherill Park	A. J. Hedges, Wetherill Park.
Windsor	W. H. Spinks, Windsor.
Wollun	J. B. Anderson, Wollun.
Wolseley Park	L. M. Evans, Wolseley Park.
Woonona	H. Coltman, Woonona
Wyan	—
Wyong	Edgar J. Johns, Wyong.
Yass	C. N. Howard, Yass.
Yarramalong	E. Hodges, Yarramalong.
Yetholme	—
Yurrunga & Avoca	F. Saville, Yurrunga.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1919.

Society.	Secretary.	Date.
Narandera P. and A. Association	J. Faulkner	Sept. 9, 10
Albury and Border P., A., and H. Society	F. J. Belbridge	,, 9, 10, 11
Young P. and A. Association	T. A. Tester	,, 9, 10, 11
Northern A. Association (Singleton)	J. T. McMahon	,, 10, 11, 12
Cowra P., A., and H. Association	E. P. Todhunter	,, 16, 17
Culcairn P., A., H., and I. Society	J. B. Ryan	,, 16, 17
Ganmain A. and P. Association	T. S. Henderson	,, 16, 17
Temora P., A., H., and I. Association	A. W. Ness	,, 16, 17, 18
Burrowa P., A., and H. Association	W. Burns	,, 18, 19
Canowindra P., A., and H. Association	H M. Brown	,, 23, 24
Murrumburrah P., A., and I. Association	W. Worner	,, 23, 24
Wyalong District P., A., H., and I. Association	T. A. Smith	,, 23, 24
Gilgandra P. and A. Association	G. Christie	,, 24, 25
Holbrook P., A., and H. Society	J. S. Stewart	,, 30, Oct. 1
Deniliquin P. and A. Society	P. Fagan	Oct. 1
Tocumwal P. and A. Association	A. J. Williams	,, 3
Hay P. and A. Association	C. L. Lincolne	,, 15, 16
Orange A. and P. Association	W. J. I. Nancarrow	,, 15, 16
Bathurst A., H., and P. Association (Spring Show)	S. V. Turrell	,, 29, 30
Tweed River A. Society (Murwillumbah)	T. M. Kennedy	Nov. 12, 13

1920.

Kiama A. Society	G. A. Somerville	Jan. 24, 26
Nimbin A. and I. Society	R. R. Southwell	,, 27, 28
Berry A. Association	W. Pryor	Feb. 4, 5
Ulladulla A. and H. Association (Milton)	R. F. Cork	,, 18, 19
Dapto A. and H. Society	F. James	,, 20, 21
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 24, 25, 26
Newcastle A., H., and I. Association	E. J. Dann	,, 25, 26, 27, and 28.
Berrima District A., H., and I. Society	C. E. Wynne	Mar. 4, 5, 6
Mudgee A., P., H., and I. Association	E. J. Hannan	,, 9, 10, 11
Hunter River A. and H. Association (West Maitland)	E. H. Fountain	,, 10, 11, 12, and 13.
Armidale and N.E. P., A., and H. Association	A. McArthur	,, 16, 17, 18, and 19.
Cobargo A., P., and H. Society	T. Kennelly	,, 17, 18
Macleay A., H., and I. Association	E. Weeks	,, 17, 18, 19
Camden A., H., and I. Society	A. E. Baldock	,, 18, 19, 20
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 24, 25
Royal Agricultural Society of N.S.W.	H. M. Somer	March 29 to April 7.

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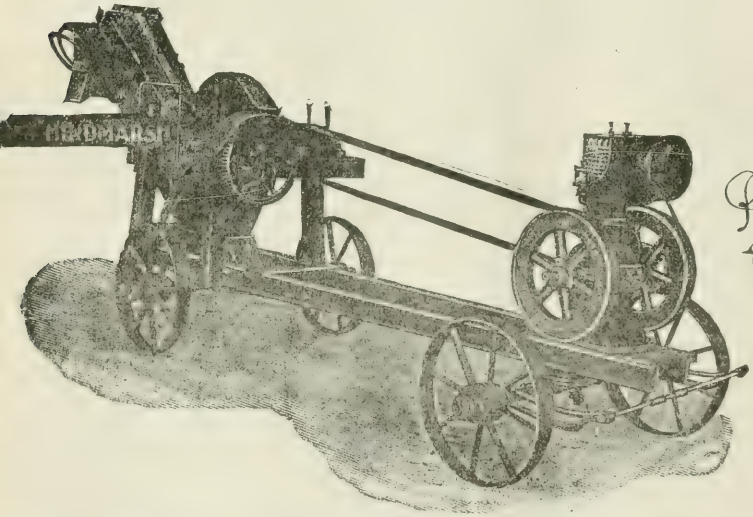

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2nd October, 1919.

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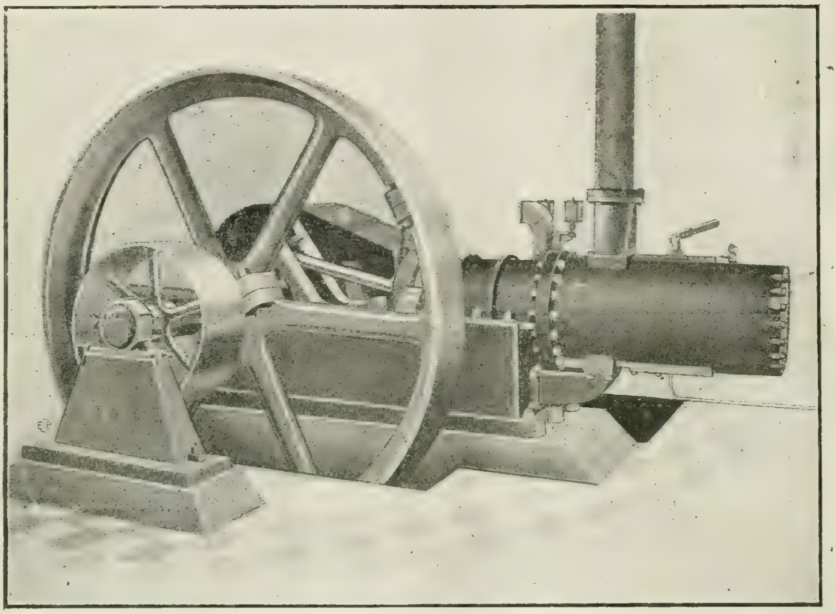

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VOL. XXX. PART 10. OCTOBER 2, 1919.

Agricultural Gazette of New South Wales.

A Dry Method of Treating Seed Wheat for Bunt.

G. P. DARNELL-SMITH, D.Sc., F.I.C., F.C.S., Biologist, and H. ROSS, Manager, Wagga Experiment Farm.

IN the past the orthodox method of treating seed wheat for the prevention of bunt has been pickling in a bluestone (copper sulphate) solution, and almost every farmer in New South Wales (and, indeed, throughout Australia) who has adopted a preventive has used this one. For years, however, the writers have held the opinion—borne out by laboratory tests and field experience—that the bluestone solution has a distinctly injurious effect, not only on cracked and damaged grains, but also on sound seeds, in so far that it retards and in some cases even prevents germination. It has been frequently observed that if seed wheat is pickled some time before sowing, or even if the seed is sown a day or so after it has been pickled but lies in the ground for a lengthy period before germinating, the corrosive action of the bluestone greatly impairs germination and often the subsequent vitality of the plant; sometimes it kills the germ completely.

The effect of the copper sulphate upon the seedling is illustrated in the accompanying illustrations. In the cases represented in Figs. 1, 2 and 3, the grains had been infected with the spores of bunt, after which those in Fig. 1 were pickled in the ordinary way in a bluestone solution, those in Fig. 2 received no fungicidal treatment at all, and those in Fig. 3 were treated with dry copper carbonate. The seeds were then sown under such conditions as permitted their root development to be observed, and a comparison of the three plates will show the deleterious effect that the bluestone had on the grains in Fig. 1.

Similarly, Figs. 4, 5 and 6 may be compared; these grains had also been infected with bunt, after which 100 grains that had been dipped in a 1½ per cent. solution of copper sulphate for three minutes were planted in one pot (Fig. 4), 100 grains that had had no fungicidal treatment were planted in another pot (Fig. 5), and 100 that had been treated with dry copper carbonate were planted in a third (Fig. 6.) The comparison again shows how deleterious is the effect of the bluestone wet treatment upon germination.

Fig. 7 presents exactly the same results; in this case 100 grains of each treatment had been germinated upon damp blotting-paper with a view to illustrating the root development in that way; unfortunately, however, it proved impossible to get a satisfactory reproduction of the roots with a background of white blotting-paper, and a few representative grains were therefore selected from each lot and photographed as shown in Fig. 7.

In the past it has been the practice of the Department to recommend that after the seed has been treated in the bluestone solution it should be immersed in limewater, made from freshly-burnt lime, so as to neutralise the acid action of the sulphate of copper. Unfortunately, freshly-burnt lime is not always available in wheat-growing districts, and only a small percentage of wheat-growers have followed this part of the Department's recommendation.

The present writers go a step further, however, and throw out the suggestion that, apart from the corrosive action of the bluestone, the mere dipping of seed wheat in water has a more or less injurious effect upon the future plant. If a bushel of wheat, for instance, is immersed in water for three minutes it takes about twelve to eighteen hours to dry. During that time the germ "springs," that is, the seed partly germinates, and if it is not sown immediately in a moist seed-bed that will continue the germination, the swelled grain recedes again, and when a second germination follows, perhaps weeks later when the conditions are again favourable, the development cannot be so healthy and vigorous as if the grain had never commenced to germinate in the first instance. In fact, wheat-growers know that when wheat is sown in a dry seed-bed and no rain is experienced for say four or five weeks, a faulty germination is frequently the result; in most cases this can be traced directly to the injurious effects of the bluestone solution.

With a view to eliminating the use of water and of finding a less harmful fungicide than the bluestone, experiments have been conducted during the last four years, the object being to discover a method of dry pickling with either a powder or a gas. Several mineral and other dry substances were found to be complete fungicides, but they had more or less injurious effects upon the germination of the wheat, and on the subsequent vitality of the plant; the same may be said of the gases experimented with. One substance, however, was discovered which not only proved a perfect fungicide and harmless to the seed, but which could be applied dry. This substance is carbonate of copper.

The method of treating the seed wheat that was finally adopted was to dust dry copper carbonate through the seed at the rate of 2 oz. of the fungicide to one bushel of wheat. It was found to be essential that the grain should be completely dusted with the powder, and this is best done with a machine that thoroughly mixes the powder with the grain; mixing by hand does not answer the purpose, it being impossible to ensure that every grain shall be thoroughly dusted, to say nothing of the laboriousness of the operation.

In order that the data recorded in a previous article* might be confirmed, larger and more comprehensive tests have been carried out at Wagga and Cowra experiment farms, 5 acres being sown on each farm in 1917, and smaller areas in the following season.

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* The Prevention of Bunt; Experiments with Various Fungicides.—G. P. Darnell-Smith, *Agricultural Gazette of New South Wales*, March 1917, p. 185.

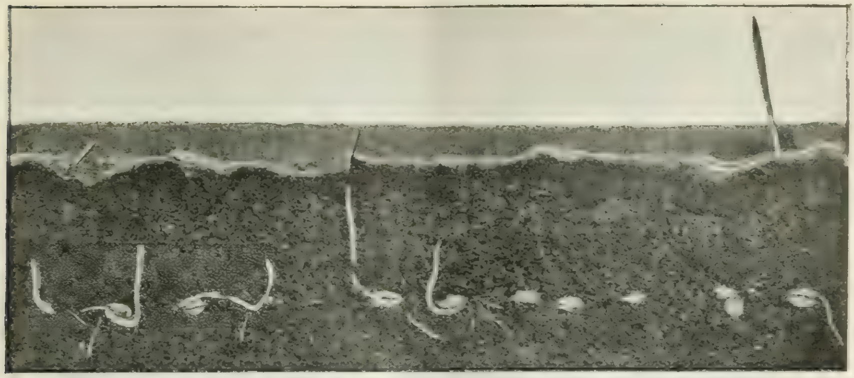


Fig. 1.—Seed treated with Bluestone Solution

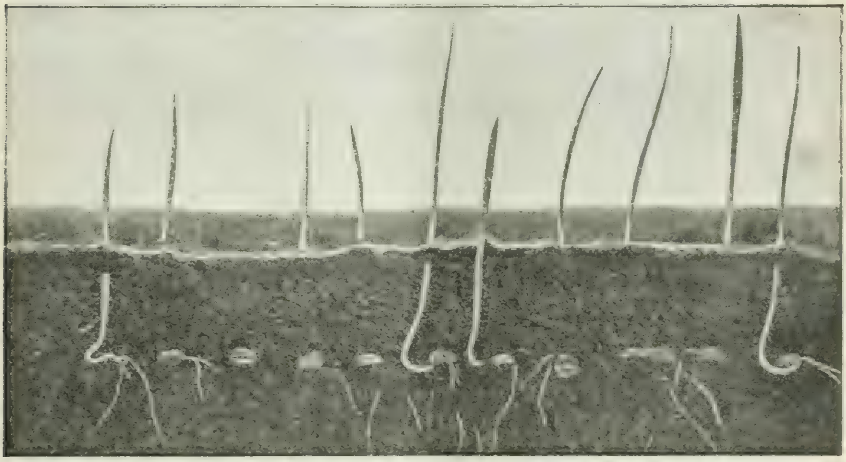


Fig. 2.—Seed not treated with any Fungicide.

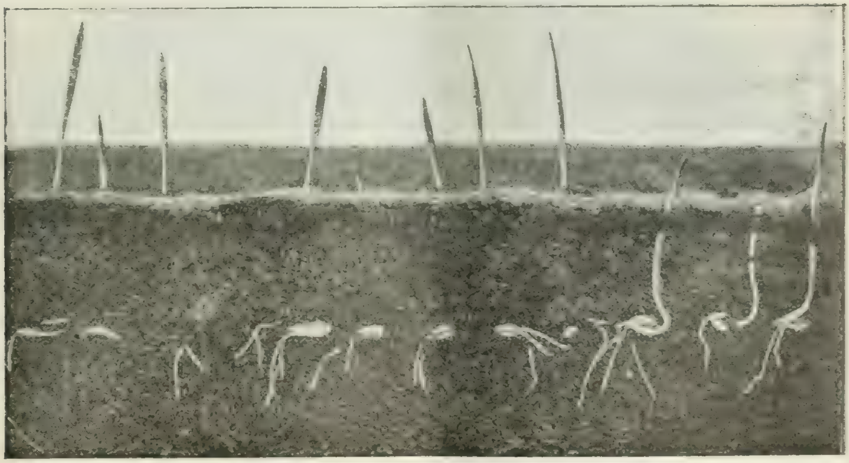


Fig. 3.—Seed treated with Dry Copper Carbonate.

A Dry Method of Treating Seed Wheat for Bunt.

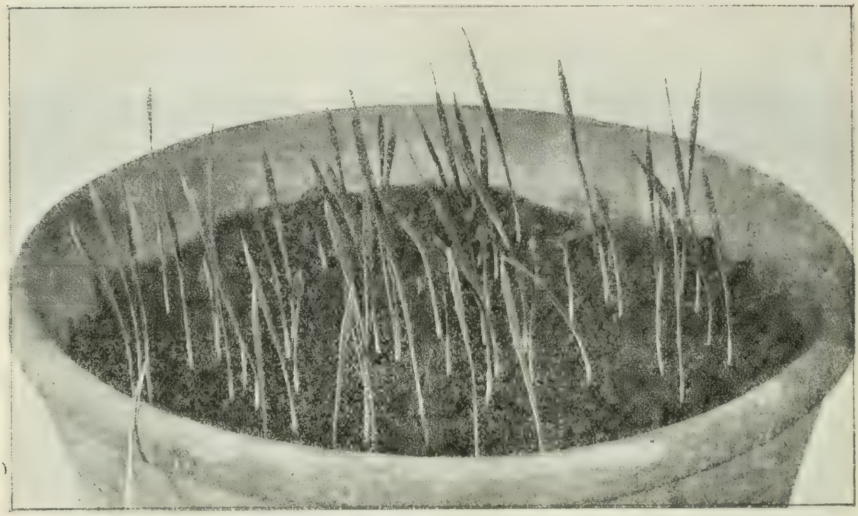


Fig. 4.—Seed treated with Bluestone Solution.

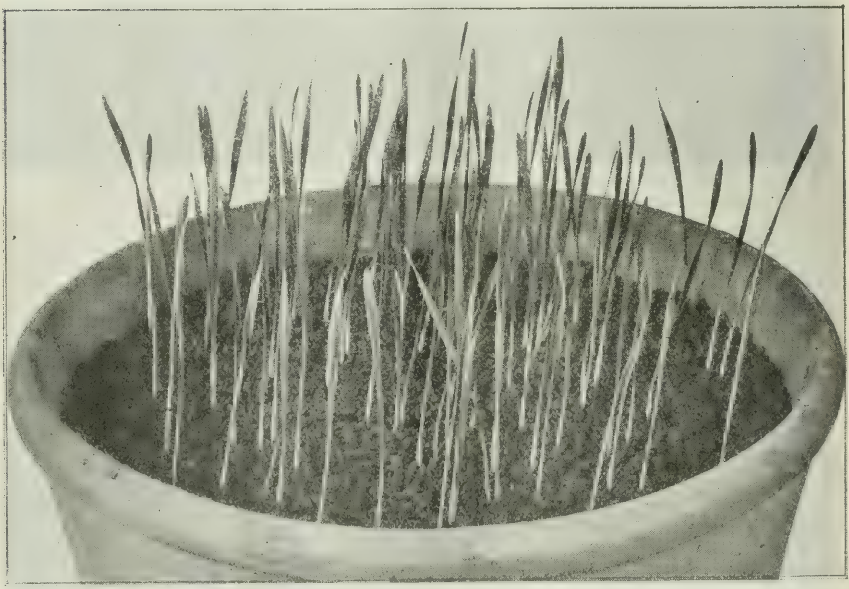


Fig. 5.—Seed not treated with any Fungicide

A DRY METHOD OF TREATING SEED WHEAT FOR BUNT.

In the tests of 1917 the seed was again heavily infected with bunt, half of it being machine-treated with the copper carbonate at the rate of 2 oz. per bushel and the other half hand-treated. The check plots were sown with infected seed that had not been treated with the fungicide. The plot sown with machine-treated seed was found, as the plants grew, to be absolutely free from bunt, while that sown with hand-treated seed showed a few bunty heads; the plot sown with infected but untreated seed contained about 40 per cent. of bunty heads. The results at Cowra in that year pointed to similar conclusions, but the experiment was considerably interfered with by rust.

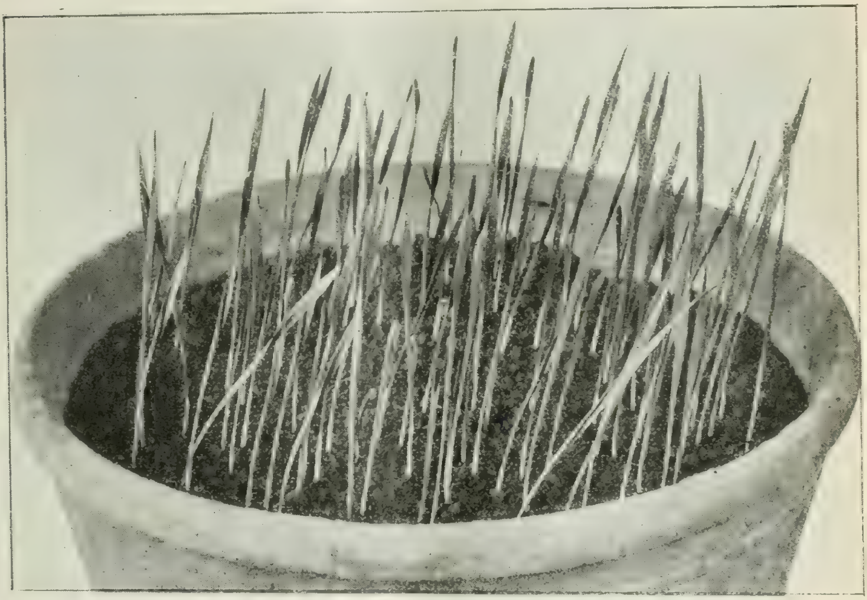


Fig. 6.—Seed treated with Dry Copper Carbonate.

In 1918, further experiments were conducted at Wagga and Cowra experiment farms, the results again demonstrating the superiority of the copper carbonate over the bluestone treatment. In order to eliminate any possible chance of error, the experiments on each farm were conducted in triplicate in this season, with most astonishing results.

Results at Wagga in 1918.

At Wagga the increase in the yield from plots sown with seed treated with copper carbonate was, in one instance, more than double the yield obtained from the plot sown with seed treated with bluestone, and in other instances the increase was from 30 to 35 per cent.

The variety chosen for the experiment was Firbank, the seed being sown on 18th June, 1918, at the rate of 35 lb. per acre, with 56 lb. superphosphate per acre. The experiment was divided into two parts, in the first of which the seed was treated with the fungicides but without being infected with bunt, the object being to test the effect of the fungicides upon the yield; in the second part, the seed was first infected with bunt and then treated with the fungicides. The results were as follows :—

YIELD TEST (Seed not Infected with Bunt).
Area, $\frac{1}{5}$ acre.

Plot.		Treatment.	Plot Yield.	Yield per Acre.	
			lb.	bush.	lb.
(*a*)	1	Bluestone only	102	8	30
	2	Dry copper carbonate ...	138	11	30
(*b*)	3	Bluestone only	85	7	5
	4	Dry copper carbonate ...	128	10	40
(*c*)	5	Bluestone only	82	6	50
	6	Dry copper carbonate ...	165	13	45

FUNGICIDE TEST (Seed Infected with Bunt).
Area, $\frac{1}{5}$ acre

Plot.	Treatment.	Plot Yield.	Yield per Acre.	
		lb.	bush.	lb.
1	Copper carbonate	336	11	12
2	Bluestone only	275	9	10
3	(*Check*) Infected, untreated...	127	10	35

Results at Cowra.

At this farm the differences in the yields in 1918 were not so striking as at Wagga, but increases of 2 to 3½ bushels per acre were obtained. The variety used in the test was again Firbank, 60 lb. of seed per acre being sown on 22nd June, 1918, with 56 lb. superphosphate. The seed treated with bluestone solution was slower in germinating than that treated with copper carbonate, and the latter also made much more rapid and even growth; eight weeks from planting both sets of plots were very similar in appearance, and it was impossible to distinguish between them until nearing harvest, when the copper carbonate plots again showed up to advantage. Bunt was not observed in any of the crops. As at Wagga, the experiment was divided into two parts, viz., (1) seed grain treated with fungicides but without being infected with bunt, and (2) seed grain first infected with bunt and then treated with the fungicides. The results appear on page 692.

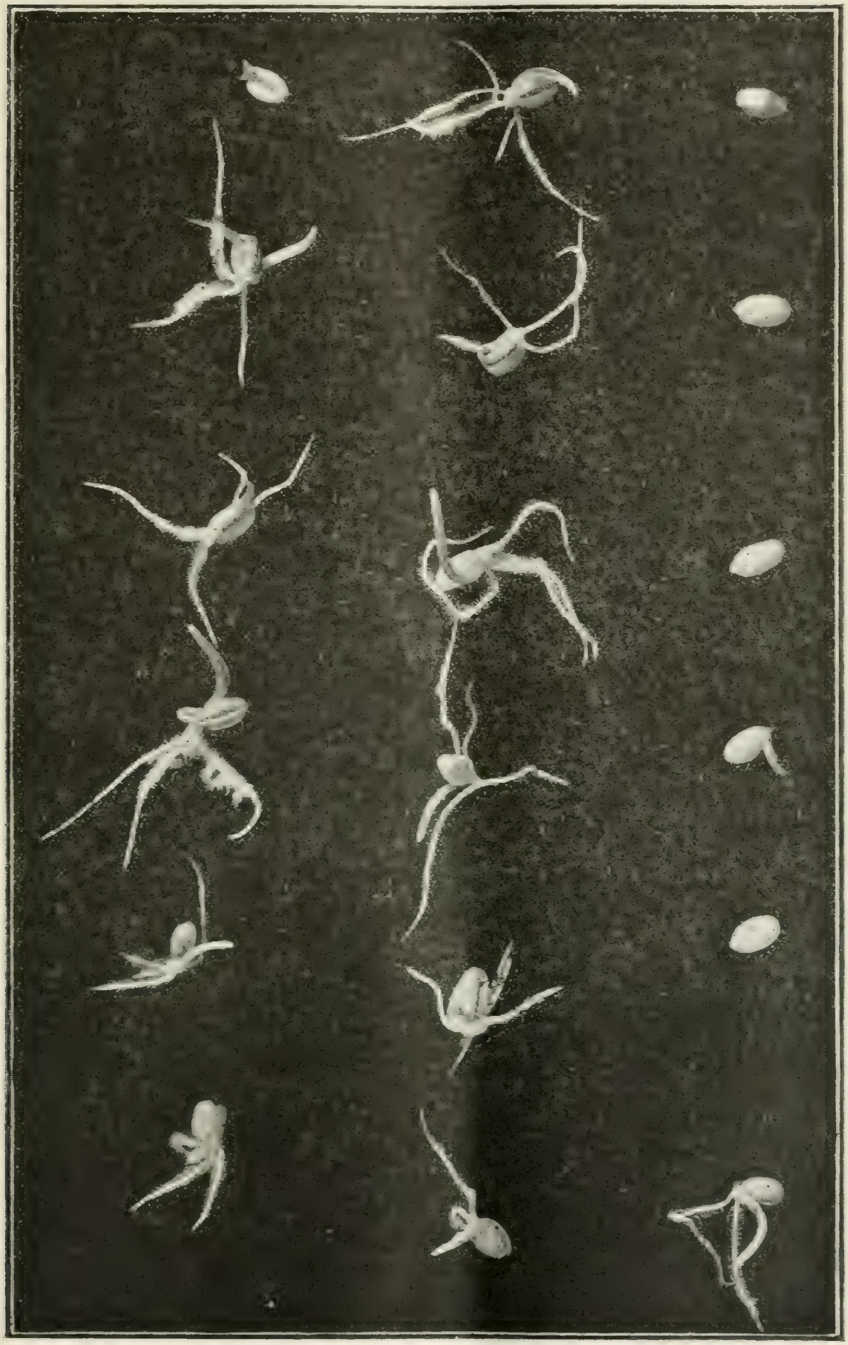


Fig. 7.—Top row—Seed untreated. Middle row—Treated with Dry Copper Carbonate. Bottom row—Treated with Bluestone Solution.

YIELD TEST (Seed not infected with Bunt).
Area, ¼ acre

Plot.	Treatment.	Plot Yield.	Yield per Acre.
		lb.	bushels.
(*a*) 1	Bluestone only	282	18·8
2	Dry copper carbonate ...	275	18·33
(*b*) 3	Bluestone only	231	15·4
4	Dry copper carbonate ...	275	18·33
(*c*) 5	Bluestone only	244	16·27
6	Dry copper carbonate ...	284	18·93

FUNGICIDE TEST (Seed infected with Bunt).
Area, ½ acre.

Plot.	Treatment.	Plot Yield.	Yield per Acre.
		lb.	bushels.
1	Dry copper carbonate ...	529	17·63
2	Bluestone only	473	15·77
3	Untreated	290	19·33
4	Dry copper carbonate ...	523	17·43
5	Bluestone only	459	15·3

A fair amount of bunt was apparent in the plot with untreated seed in the second part of the experiment.

Summary.

The results show distinct increases in the yields per acre where the new copper carbonate treatment had been substituted for the old bluestone one. As already remarked above, these increases were substantial, amounting in some cases to practically 100 per cent. When we consider that the area under wheat in New South Wales alone is some 3,000,000 acres annually, it is quite apparent that an average increase of only 1 bushel per acre would represent a very substantial amount indeed as a result of the improved method of treatment.

The advantages accruing from the use of dry copper carbonate instead of the bluestone solution may be summarised as follows :—

1. No water is required.
2. No injurious effect is caused to either the grain or the young plant, as is the case with bluestone pickling.
3. Seed wheat can be treated weeks before it is sown.
4. No damage is done to the grain if it should lie in a dry seed-bed for weeks without germinating.
5. A better germination is obtained.
6. The process is quicker and less laborious than wet pickling.
7. A better yield is obtained.
8. The whole of the season's requirements of seed wheat can be treated at the farmers' convenience, and not necessarily within a day or two of sowing.

Farmers' Experiment Plots.

MAIZE GREEN FODDER TRIALS, 1918–19.

Murrumbidgee Irrigation Areas.

G. G. ST. CLAIR POTTS, H.D.A., H.D.D., Assistant Inspector of Agriculture.

MAIZE green fodder experiments in the form of variety trials were conducted at four centres during the past season on the Murrumbidgee Irrigation Area. The settlers co-operating with the Department in this work were:—

J. Dobb, Farm 240, Leeton.
Houghton Brothers, Farm 918, Leeton.
A. H. McDonald, Farm 151, Leeton.
H. Booth, Farm 854, Whitton.

The conditions throughout the summer months were most trying; hot drying winds were incessant, and in consequence the evaporation of soil moisture was accelerated, causing patchy germination. The natural precipitation was valueless, as only 151 points were registered from October to February, and irrigation had to be constant. With the many problems presented, credit is due to the experimenters for their interest and loyal attention.

The plots were sown in October and November, and in each instance the moisture content of the soil was all that could be desired for a speedy, satisfactory germination. However, the excessive hot winds were responsible, as stated, for remarkably rapid evaporation. At two centres flood-irrigation was adopted to promote germination, but the results were disappointing. The yields, although not particularly high, are considered satisfactory in view of the fact that germination was so erratic at each centre.

Soil and Cultural Details.

Farm 240.—The soil was a heavy clay, varying in colour from red to grey. Japanese millet was grown the previous summer, and the land was ploughed in May, 1918, and lay in the rough throughout the winter. A second ploughing was given in August, followed with the tine harrows. During the early part of October 54 points of rain fell and the opportunity of disc and tine harrowing was availed of, resulting in a friable damp seed-bed for planting operations, which were carried out on 11th October. The seed was hand-dropped at the rate of 16 lb. per acre in rows 3 feet apart, covered with the single-furrow plough and tine harrowed. Irrigation prior to sowing was not practised and the soil dried out quickly. The germination was patchy, but the first irrigation following planting promoted further germination and a fair stand. Rapid growth was maintained until January, when the plants were 6 feet high. At this juncture growth was arrested by using too great a flow of irrigation water from the head ditch, which forced the water down the furrows and prevented seepage. This was clearly demonstrated by the fact that five days after irrigation the plants in the vicinity of the head ditch had withered, whilst those situated at the lower end were much more vigorous and healthy. Undoubtedly this form of irrigation was the cause of many failures and reduced yields on the Areas during the past season.

Cultivation and irrigation during growth was as follows:—Cultivated and furrowed out, 5th November; furrow-irrigated, 5th, 17th, 30th November, 15th December, 1st, 15th, 30th January; inter-row cultivated, 11th, 23rd November, 5th, 23rd December, 6th January; plots harvested, 10th February, 1919. Of the varieties under trial, Improved Yellow Dent is the most promising. The stalks, although fairly coarse, retain their succulence longer than Boone County White, the leaf growth is denser, and the stalk growth taller.

Farm 918.—The soil was Boree (crab-holey), grey in colour, and varying from a heavy clay to a friable loam. This class of land presents many difficulties, and the experiment was outlined with the object of comparing maize and sorghum alone and in combination with cowpeas and tares to provide a well-balanced ration for dairy stock. The tares were sown out of season, but their inclusion was due to the vigorous growth on this farm of self-sown plants of this crop during the summer months of the previous season. Winter pastures were sown in the autumn, but owing to faulty germination they were ploughed under during October and the land harrowed. Irrigation was practised on 21st October, followed with the tandem disc harrow. Sowing operations were carried out on 7th November in a friable seed-bed, abundantly supplied with moisture, but inclined to be cloddy. The maize, together with the cowpeas and tares, was sown through a two-row maize planter in rows 3 feet apart. The sorghum was sown through a wheat drill.

The cultivation and irrigation during growth was:—Furrow-irrigated, 1st, 26th December, 20th January; inter-row cultivated, 9th, 20th December, 13th January.

The germination of maize was extremely weak and the plot had to be resown on 9th December. The cowpeas, tares, and sorghum came through fairly well, but the subsequent stand was most uneven. The weak growth of tares clearly demonstrated that this crop is unsuitable for planting out of season, whilst the cowpeas grew only 1½ feet in height, with very little bulk. Owing to the uneven growth, fair comparative weights could not be obtained.

Farm 151.—Sowing operations were conducted on 15th and 16th November, the soil being Boree (crab-holey), in excellent order, and with ample moisture present. A wheat drill was employed, the hoppers being blocked up to sow the rows 3½ feet apart, and set to sow 20 lb. of seed per acre. Superphosphate was applied at the rate of 2 cwt. per acre. Japanese millet had occupied the land previously, and the first ploughing was given in

September, 1918. During October the following operations were carried out:—Flood-irrigated, disc-harrowed twice, and disc-ploughed. On 10th November the land was again flood-irrigated, followed with a spring-tooth cultivation prior to sowing, and tine-harrowed afterwards. The land was undoubtedly in perfect condition and the seed well covered, but in spite of this a patchy germination followed, and it was found necessary to flood-irrigate after sowing. Growth throughout the season was disappointing, and this is attributed largely to lack of inter-row cultivation and to the practice of flood-irrigating. During the growing period, the plots were irrigated four times in monthly rotations without any cultivation whatever. Considering the patchy germination and subsequent treatment the yields are highly satisfactory. The comparatively good yield of Palecap Yellow Horsetooth and Leaming can be accounted for largely by better germination than other varieties under trial, whilst Hickory King failed owing to extremely weak germination, attributed to poor seed.

Farm 854.—Virgin land was selected at this centre, the soil being a heavy red clay loam, 6 inches in depth, overlying a retentive clay subsoil. Ploughing operations were conducted in September, followed with the tine harrows. The land was flood-irrigated, ploughed a second time, and harrowed during the early part of November. Sowing operations were conducted on 19th and 20th November through a wheat drill, the rows being 3½ feet apart and the seeding at the rate of 20 lb. per acre, with 1½ cwt. of superphosphate. Owing to slow germination it was decided to flood-irrigate, and a patchy germination followed. The shy germinating quality of Hickory King was again demonstrated.

The plots received every attention, and vigorous growth was maintained throughout the season. In view of such a thin stand the yields are most satisfactory, and are due entirely to thorough irrigation and constant cultivation. Red Hogan showed vigorous growth early in the season, and maintained it throughout. The same might be said of Improved Yellow Dent, but the germination was not so even. Boone County White and Hickory King matured a fortnight earlier than the other varieties. On 24th January a start was made to cut and feed the maize night and morning to thirty head of cattle. This was continued for two months, the milk flow being maintained off only 4½ acres. The crop was a valuable asset during the severe summer months, when natural pastures were dry and scarce. The plot was no doubt an object-lesson to surrounding settlers, and it is anticipated that in the future more attention will be directed to the cultivation of summer fodders, the latter being essential if maximum results are to be obtained from the dairying industry.

The cultivation and irrigation during growth were:—Flood-irrigated to promote germination, 22nd November; harrowed across the crop, 27th November; furrow-irrigated, 6th, 20th December, 5th, 17th, 31st January; inter-row cultivated, 11th, 27th December, 10th January; plots harvested—Boone County White and Hickory King on 28th February; Improved Yellow Dent and Red Hogan on 13th March.

RESULTS of Maize Green Fodder Variety Trials, Murrumbidgee Irrigation Areas, 1918–19.

A. H. McDonald, Leeton.					H. Booth, Whitton.				
Variety.	Acre Yield.				Variety.	Acre Yield.			
	t.	c.	q.	lb.		t.	c.	q.	lb.
Improved Yellow Dent (*check*)	7	11	0	8	Improved Yellow Dent (*check*)	13	12	0	16
Leaming	9	3	2	12	Red Hogan	17	10	0	0
Hickory King	Failed.				Hickory King	11	7	0	16
Pale Cap Yellow Horsetooth	11	0	0	0	Boone County White	11	7	2	0
Large Yellow Horsetooth	7	2	2	0	Improved Yellow Dent (*check*)	13	13	3	20
Boone County White	7	2	3	12					
Improved Yellow Dent (*check*)	7	6	3	4					

J. Dobb, Leeton.

Variety.	Acre Yield.			
	t.	c.	q.	lb.
Improved Yellow Dent	9	6	3	4
Boone County White	7	8	0	24

Varieties under Trial.

Improved Yellow Dent is a late maturer, possessing coarse stems which retain their succulence to a late stage of growth and carry a large percentage of broad leaves. The stalks averaged 9 feet high. The coarseness can be eliminated to a large extent by sowing thicker. The maturing period for silage or green fodder averaged fifteen weeks. This variety can be recommended for planting on the Irrigation Areas for fodder purposes.

Red Hogan matures in somewhat the same time as Improved Yellow Dent, or perhaps a few days later. The stalks averaged 10 feet in height, carrying heavy leaf growth. Coarse stems predominated, but succulence was retained to a late period. Its performance on Farm 854 is creditable, and it is worthy of further trial.

Palecap Yellow Horsetooth is a new variety to the district which shows great promise. The stalks are not so coarse as in the previous two, and the maturity is identical with Improved Yellow Dent. The average height of stalk growth was 9 feet, and there was a large percentage of leaves. Further trials will be conducted with this variety.

Leaming is a mid-season variety, possessing fine stems and maturing in twelve to thirteen weeks for fodder. The flag growth is not heavy, but the fine stems are most suitable for feeding, and it should become a popular variety for later sowing.

Boone County White matures a few days later than Leaming, and shows promise as a fodder. The stalks averaged 7 to 8 feet in height, being medium in thickness and carrying fairly dense leaf growth. The lower leaves of this variety appeared to be scorched badly, which was not noticeable with other varieties under trial.

Hickory King was handicapped by the weak germination, not a characteristic of the variety, but due to bad seed. It matures about the same time as Boone County White, possessing characteristics of growth somewhat similar. Further trial will be given this variety.

Large Yellow Horsetooth is a late-maturing variety, with coarse stems and heavy leaf growth. It averaged 9 feet in height, but the yield was reduced considerably by weak germination. From observation it is certainly worthy of further trial.

Conclusions.

It has been demonstrated clearly that dairying on the Murrumbidgee Irrigation Areas is a sound proposition, attended with very profitable results, but unless the question of growing summer fodder crops is given greater consideration by settlers, maximum milk and butter-fat yields will not be obtained.

During the autumn, winter and spring months, on most of our soils, natural pastures are valuable, but these soon dry off with the advent of hot winds in the summer, and it is during this period that provision must be made for some succulent food to maintain the milk flow. In this connection maize should be regarded as one of our foremost crops. It is necessary to remember, however, that maize alone is not a well-balanced ration for milk production, and in order to obtain full benefit from the feeding of this crop, some legume such as lucerne or clover should be supplied. Further, ensilage is destined to play a leading part in the future of the dairying industry on the Irrigation Areas, and maize is eminently suited for conservation in this form. The highest feeding value is obtained when the grain is glazing, or, in other words, during the advanced milky condition. Fine stems, together with succulence, should be the aim of the grower; and if 20 to 25 lb. of seed per acre is sown in drills 3 feet apart, yields up to 25 tons or more per acre will be possible, providing a good germination is obtained and is followed by ordinary attention, such as furrow irrigation and inter-row cultivation during the growing period. The initial preparation of the soil cannot be too thorough. Early deep ploughing, short fallow, irrigation prior to planting, followed by a second ploughing, cultivation, harrowing and sowing through a maize dropper, all tend towards improved yields.

The practice of flood irrigation after sowing, with the object of germinating the seed, spells failure, and in view of the fact that hot winds are generally prevalent during the planting season, a rotation of sowings in small areas is the only safe method to adopt. This practice ensures an even, quick germination, as sowing operations can be completed before much evaporation takes place, and a damp seed-bed is assured. Further, the rotation system allows of the feeding time to be extended and the crop harvested at the most economical stage. Not more than 3 acres at a time should be planted. The practice of sowing with a wheat drill cannot be recommended, for the seed is distributed unevenly and the soil is not compacted around the seed, thus allowing of rapid evaporation. The maize-dropper provides for soil compaction, supplying the seed with moisture by capillarity. Irrigation in furrows is the most beneficial; but if maximum growth is to be maintained, a slow rate of flow from the head ditch is essential, to allow of seepage. Hilling the maize is an insurance against lodging to a large extent, and this practice has everything to commend it. Maize is a heavy feeder, and in view of this fact a systematic rotation should be adopted, with the inclusion of a legume and green manure crop to build up the humus content of the soil.

Disappointing results will follow if the land is cropped with maize year after year. Unfortunately, rotation of crops is not recognised sufficiently in this district.

For efficient irrigation, strict attention must be given to the retention of levels. By injudicious ploughing these can be largely interfered with, ultimately causing much difficulty in irrigation. Cross-ploughing should, if possible, be dispensed with, but in case this method is adopted, the final operation must be practised in the direction of the natural fall.

SACCHARINE SORGHUM TRIAL.

In co-operation with Mr. J. Sippel, Farm 138, Leeton, an experiment was conducted comparing selected and bulk seed of Planter's Friend and Early Amber Cane sorghum. This was attended with disappointing results. Sowing operations were carried out on 14th January, 1919, the soil being a red clay loam, from which a crop of oats had been harvested for hay during November. Following this, the land was flood-irrigated and ploughed in December, cultivated, harrowed, furrow-irrigated, cultivated and harrowed in the order mentioned prior to sowing in January. The seed was sown through a wheat drill at the rate of 15 lb. per acre without manure, and the land then harrowed. The germination was excellent, but extremely slow growth followed, and the plots received a check with frost during the latter part of February. The comparatively vigorous qualities of the selected strains was demonstrated early in the season, and their earliness in maturity was well marked, especially in the case of Planter's Friend, the bulk seed plot of which never reached maturity, being cut back severely with frost in May.

The following characteristics were noted at harvesting on 27th May:—

Early Amber Cane (selected strain).—Three weeks earlier in maturity than bulk seed; much finer stems, standing 4½ to 5 feet in height.

Early Amber Cane (bulk).—Coarser stems than the selected, later in maturity, and not so even in growth. Average height, 4½ feet.

Planter's Friend (selected strain).—A vast improvement in comparison with the bulk; average height, 5 feet; most even growth of all the plots; fine stems, well forward in ear.

Planter's Friend (bulk).—Extremely poor growth; average height, 2 to 2½ feet; a few isolated plants with ears peeping; cut back severely with frost.

The irrigation and cultivation during growth was:—Furrow-irrigated, 3rd, 18th February, 20th March, 24th April; cultivated, 10th February; cultivated and furrowed out, 14th February.

RESULTS of Saccharine Sorghum Trial, Murrumbidgee Irrigation Areas, 1919.

Variety.	Acre Yield.			
	t.	c.	q.	lb.
Early Amber Cane (bulk)	3	19	2	0
,, ,, ,, (selected)	3	19	3	0
Planter's Friend (bulk)	2	4	2	0
,, ,, (selected)	4	0	2	0

The extremely low yields are attributed to late sowing and check by frost in February and March. The comparative weights are of little value, and no definite conclusions can be drawn from the experiment. However, it is proposed to conduct trials in the same direction next season, sowing earlier.

COMPARATIVE VALUES OF VARIETIES OF WHEAT.

ALTHOUGH (owing to the influence of many factors, and particularly to that of weather conditions prevailing during growth) it is impossible to make a definite statement as to the comparative monetary value of different varieties of wheat, those enumerated below, if running about the same weight per bushel, and equally plump and clean, may be placed in the following massed order:—Comeback; Marquis and Hard Federation; Improved Federation, Marshall's No. 3, Dart's Imperial, Yandilla King, Bunyip, Penny, Lotz, Bomen, Canberra, Gluyas, Firbank and College Purple; Purple Straw and Federation.

The yield of mill products depends largely upon the condition of the sample. Generally speaking, the hard translucent varieties, such as Comeback, produce small, thin, clean bran, while the soft wheats of the Federation type produce a good, broad, thick bran. With proper conditioning prior to milling, the hard wheats yield almost as much flour as the soft wheats.

Concerning the volume of bread produced from the different varieties, this again depends upon a combination of factors, the principal being the volume of gluten. Flour from such wheats as Comeback invariably produces a large volume loaf. The yield of bread will vary according to the amount of water absorbed by the flour when being made into dough.

As to the nature of the flour, Comeback, Marquis and Hard Federation yield a sharp granular flour of a pale-yellow shade when compared with the remainder of the wheats mentioned, the flour from the soft wheats being bulky, less granular, and not so yellow in colour as the strong wheats.—F. B. GUTHRIE.

Some Points in Oat Growing.

J. T. PRIDHAM, Plant Breeder.

As with all crops, the first of the essential points in the successful growing of oats is obviously the selection of a good sample of seed. The grain chosen should be plump and well cleaned and threshed, so that it will run freely through the drill without clogging. The last-mentioned process is even more important than grading, for a dirty, half-threshed sample causes patchy and uneven germination. Oats may be graded with a blower or winnower to separate the light and empty kernels. The latter can be utilised for feeding stock and the heavy grains for seed, so as to ensure a uniform vigorous stand.

When oats are grown for hay or green fodder in the warmer districts it pays to get seed from cooler country, the resulting growth being taller and more vigorous. For instance, a Trundle grower should get seed, if possible, from Bathurst, Orange, or even Cowra. For seed production and for feed grain, however, a farmer at Trundle would do better to grow his own and select the best seed mother plants. As a rule, we do not believe in change of seed, but in the case of oats for hay the cooler climates favour stronger development than the warmer areas. At Cowra we find that our locally-bred Algerian oats give a superior yield of grain, but the crop is less bulky for hay than that grown from Glen Innes seed. A dry, warm climate tends to dwarf plant growth, and this is undesirable from the hay-grower's point of view.

Preparation of the Soil.

Oats are sometimes left to take their chance on unfallowed or poorly prepared soil. Although the crop is hardy and makes a good show under such conditions, it responds well to good treatment. The roots are not nearly so deep and extensive as those of wheat, but deeper ploughing is recommended than for the latter (storage room for rain being thus provided), together with good cultivation to ensure cool, moist root range.

When pulling up an oat plant it will be noticed that the wheat seedling has a far firmer hold of the soil than the young oat.

The quantity of seed to sow differs with the variety, the climate, the time of sowing, and the soil—least of all with the soil. With a good rainfall oats become coarse if not sown thickly, and as the season advances sowings require to be heavier, in order to make up for the lack of stooling. Oats should be sown less thickly for grain than for hay production. Farmers will modify their practice to suit local conditions and experience, but a guide as to quantities may be given. Thirty pounds for early and 40 lb. for mid-season sowing would be about right for Algerian; and for Guyra and Lachlan, 40 lb. for early, 50 lb. for mid-season, and 60 lb. for late sowings. Algerian should not be sown after mid-season; Sunrise (which stools less than the foregoing), if sown early for feeding off should be put in at about 40 lb., mid-season at 50 to 60 lb., and late at 60 to 80 lb. per acre. These amounts may be varied for different districts and needs, but they are about right for the Central Tablelands.

Pickling seed is not usually necessary for the varieties quoted, but if late oats such as Potato and White Tartarian are grown it is advisable to pickle for smut with formalin, soaking the seed for five minutes in a 1 to 400 solution.

Fertilisers, Sowing Depth and Varieties.

Concerning fertilisers—with all due respect to the manure agents—it has to be recorded that superphosphate is the only fertiliser which we have found necessary for the oat crop. Special oat manures, except on unusually poor land, are not in our experience required for New South Wales conditions.

Regarding the depth to sow, it must be remembered that oats take a little more moisture to germinate than wheat, and while 2 inches is a good depth in a moist seed-bed, they should be put down 3 inches if the soil is moist at that depth. If the soil is dry to a depth of 3 or 4 inches it would be wiser to plant 2 inches deep and wait for rain. Although wild oats will come up from a depth of 4 to 5 inches, the plants are not so strong as if they had germinated nearer the surface.

Of suitable varieties, Algerian, Guyra, Lachlan and Sunrise have already been mentioned; Ruakura, an excellent oat for the coast, has about the same season as Sunrise. We may group oats according to their stooling or tillering capacity, this tallying with their period of maturity. Of those under consideration, Algerian is the thickest and latest of the varieties, and Sunrise is the earliest to ripen and thinnest in the number of stalks produced.

Although Algerian is a good drought resister you cannot expect to get a good plump sample of it under dry conditions. Lachlan or Guyra sown instead will yield a good plump grain, though the bulk of hay produced may not be quite equal to that of Algerian. Should a farmer's land grow too much straw and the crops go down easily, they should be fed off, or a variety grown like Lachlan, which will safely stand until stripped or cut. Should Algerian grow rather too short to make good sheaves in a dry district, Sunrise is recommended in its stead. Algerian and Ruakura are excellent oats for feeding off; the other varieties feed off well, but Guyra and Lachlan are perhaps more especially adapted for grain, while Sunrise is a good general-purpose oat for late sowing.

Harvesting; and Some General Remarks.

The harvester is not at all an ideal machine, but it is perhaps the best where sheep are kept and turned in when the crop is off. It is estimated that you cannot get more than 50 bushels per acre of grain with the stripper or harvester, whereas by cutting and threshing, up to 80 bushels per acre can be bagged from a heavy crop.

For hay purposes, oats should be left till nearly ripe, and not cut on the green side as in the case of wheat. In fact, some farmers have had disappointments with oaten hay on this account, for when cut green it has a bitter flavour that is disliked by stock and that makes it unsaleable on the market.

It has been sometimes stated that the Algerian and other sorts revert in time to the wild oat. We certainly do find seeds more or less hairy and of a darker tint than usual (the Algerian has a few hairs or fine bristles at the foot of the grain), but the true wild oat, besides being of a totally different species, is very hairy, with a coarse awn and a horse-shoe shaped mark at the lower point of the seed, which is peculiar to it. Last season a couple of plants with grain as black as any wild oat were found in a patch of a cultivated variety with white grain, but they were not so hairy as the wild oat and lacked the characteristic mark at the butt end.

Farmers need have no fear of cultivated oats degenerating to the wild type; any variety will show variations in the colour of the seed, presence or fineness of awn, and number and length of basal hairs, but we have not seen the extreme departure suggested.

RENOVATING A LUCERNE STAND.

A FOUR-YEAR-OLD stand of lucerne on the Murrumbidgee Irrigation Area, which in parts showed signs of running out, due largely to injudicious irrigation practice, recently afforded an interesting case.

A thorough scarifying with a rigid-tooth narrow-tine cultivator is advisable in such cases, and an application of superphosphate at the rate of 2 cwt., per acre. About 10 lb., of Sudan grass might be mixed with the manure and sown at the same time through the wheat drill. This practice will provide excellent grazing lucerne where the crop is still established, and the bare patches should grow Sudan grass, an essentially useful crop. The lucerne is not checked in any way by the Sudan grass, but the latter will not grow profusely where the lucerne is well established.—G. G. ST. CLAIR POTTS, Assistant Inspector of Agriculture.

SUGGESTION OF FUNGUS ON PEACH TREE.

A FUNGUS-LIKE affection on the bark of fruit trees is sometimes misleading, and the orchardist may have to search for its cause elsewhere than amongst the hosts of living organisms. The following was the report of the Biologist on some peach-tree cuttings submitted for examination recently:—

The condition is not due to any organism, but is of physiological origin. Microscopical sections showed the tissues to be saturated with gum, causing the bark to die out in patches. In the absence of any causal organism, some unfavourable soil or weather condition is most likely responsible. Lack of drainage is often responsible for similar conditions, and this should be remedied. The soil may be temporarily removed, and the root-system examined for any suspicious appearance.

Varieties of Maize in New South Wales.

[Continued from Vol. XXVIII, page 693.]

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

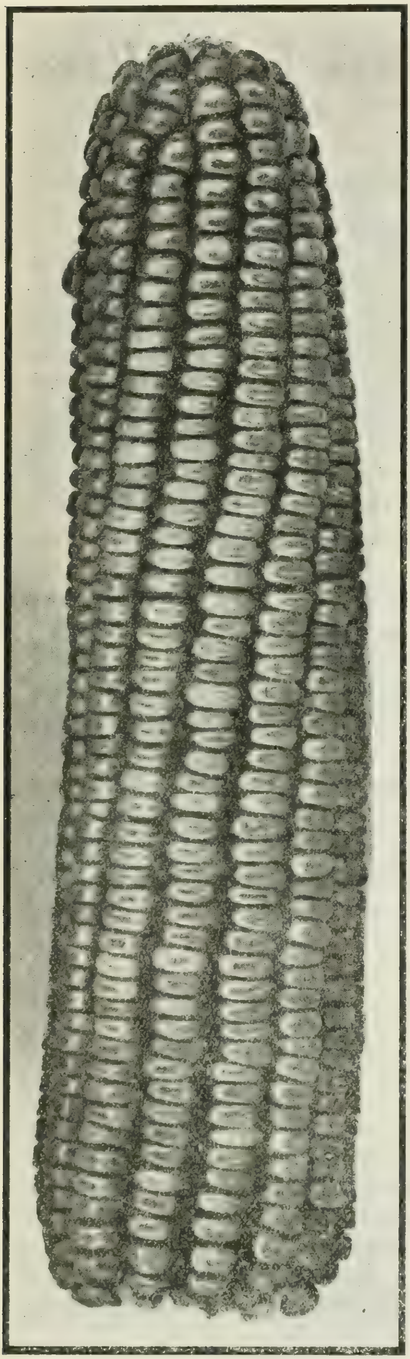
Golden Nugget.

THIS variety has been known in the State for many years. It has been more largely grown than it is at present, but it is not certain whether the diminished area sown with it is due to the inability to obtain pure seed or whether it has fallen into disfavour through not yielding as well as other varieties. Mr. J. W. Smith, Wauchope, Hastings River, has, however, persevered with the variety, and has grown it for the last twenty years or so. He finds that it suits soil which has been cropped for many years better than any other variety he has tried, and that it will yield well on those stiffer alluvial soils which are common on the lower parts of this river. This suggests that it would also suit such soils on the lower parts of many other coastal rivers, especially on the North Coast.

From the experiments conducted with this variety by the Department during the last few years, it appears to possess at least two points of distinct merit as a maize for the North Coast. In the last two seasons before 1918, leaf blight ravaged whole crops on the coast, and in a survey made during those seasons in the districts most badly affected, it was found that Golden Nugget was amongst three varieties which were least affected by the disease. This resistance to leaf blight stamps the variety as a valuable one for late sowing on the coast, the damage from this disease being usually most severe in late sown crops. Another good feature of the variety is the excellent husk covering on the cobs, by which correspondingly greater freedom from damage by grain weevils and wet weather is assured. Its hard grain also makes it more weevil resistant. It matures slightly later than Leaming, therefore taking a little over five months to ripen on the coast, so that on the North Coast it can be sown safely up to the end of December. It is not a suitable variety for green fodder, being easily beaten in yield of greenstuff by varieties such as Improved Yellow Dent or Yellow Horsetooth.

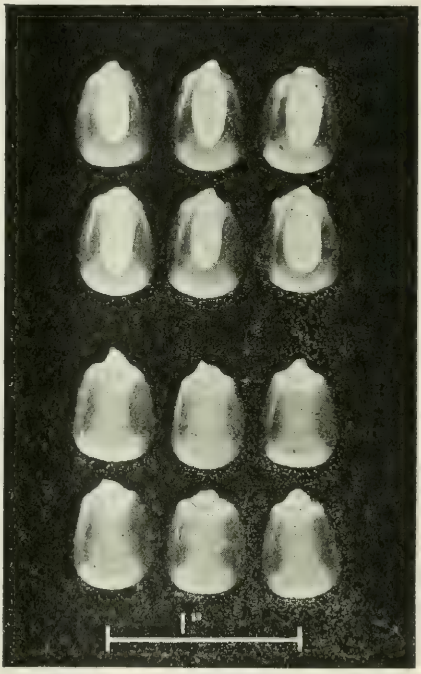
The stalk is of medium thickness and moderately tall-growing on good soil. Single ears only are usually produced on the stalk; they are supported by fairly thin shanks, which have a tendency to make the ears droop when nearing maturity. The husk covering, as stated before, is very good, and even in a wet season a large percentage of sound grain is produced.

It seems as if the variety is the result of a cross between a Yellow Dent and some flint corn, as not only do some ears have little trace of dent or only a small shallow dent in the grain, but many ears have the white core, characteristic of yellow flint varieties. The ears are cylindrical to slightly tapering in



Golden Nugget.

shape, and the standard size has a weight of 12 to 14 oz.; length, 8 to 9 inches; and circumference $6\frac{1}{4}$ to $6\frac{3}{4}$ inches. The rows number from twelve to sixteen (more usually fourteen), and are generally straight and regular. The tips are usually well filled, and the butts moderately rounded. The furrows between the rows are fairly wide, and the grain very tight on the cob. The cores are fairly small, and may be red or white. The shelling percentage is high.

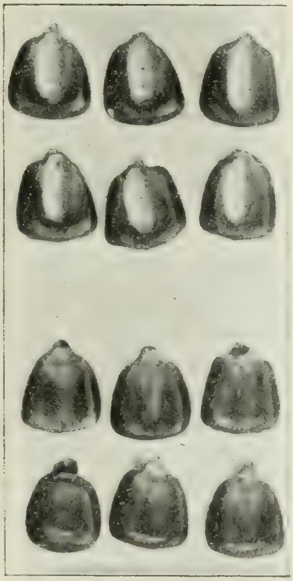


Golden Nugget.

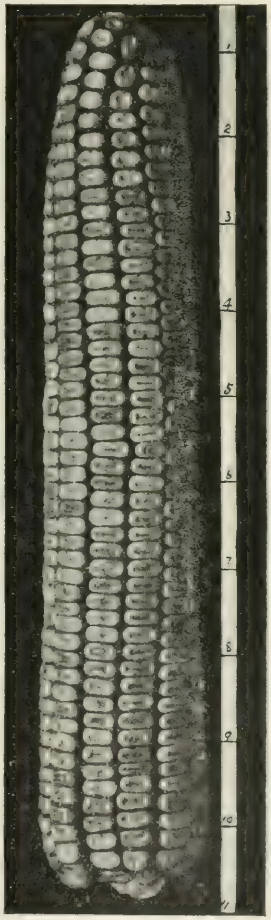
The grain is only moderately deep but heavy, $\frac{6}{16}$-inch broad, and fairly thick, with rounded sides. It has a dark-amber colour, with a very small, bright lemon-yellow cap, and a large broad germ. The grain is hard, and has an average weight of about 1,100 per lb. The bright colour and hard grain make it a very attractive sample, putting it in favour on the market, and causing it to win prizes at shows when judged from a commercial point of view as shelled grain. This variety has not received a very extensive trial in the State, but in variety tests it occupied first place at Comboyne in 1917–18, second place at Wauchope in 1916–17 and at Yarramalong in 1917–18, and third position at Casino in 1917–18.

Golden Beauty.

This variety has also been grown for some years in this State, and has survived principally in the Manning and Macleay River districts, where it is most largely grown, chiefly on the former river. It was originally obtained from America, where apparently it is now but little grown compared to other varieties. It seems to require good soil, and takes about five months to mature; it is a favourite variety for early sowing on the Manning and Macleay, where, indeed, the bulk of the maize is sown early in September. It is not suitable for late sowing on these rivers, or anywhere on the coast, owing to its inability to withstand leaf blight disease. It is not a very suitable variety for fodder.



Golden Beauty.



Golden Beauty.

The stalks are of medium thickness and height, with little tendency to sucker. A single large ear is usually borne on the stalk at a moderate height, with a tendency to droop at maturity owing to the thin shanks. The husk covering is fairly good, but may be still further improved by field selection.

The ears are long, narrow, and cylindrical in shape; the standard size has a weight of 12 to 14 oz., is $10\frac{1}{2}$ to 12 inches long, and about 6 inches in circumference. The dent is medium smooth and rather broad, but shallow in depth. The rows number usually either twelve or fourteen, and are very straight and regular. The butts are not well rounded, though the ears have generally well-filled tips. The furrows between the rows are medium to small, and the grain is very tight on the cob. The ears have a small core, and the shelling percentage is rather high.

The grain is fairly broad (about $\frac{7}{16}$ inch), wedge-shaped, and straight-sided; it is about $\frac{8}{16}$ inch deep, but appears short on account of its breadth. It is fairly thick and of medium amber colour, not too dark, with a fairly small bright yellow cap. The grain is fairly hard, with a large germ, and averages about 1,100 per lb. of seed.

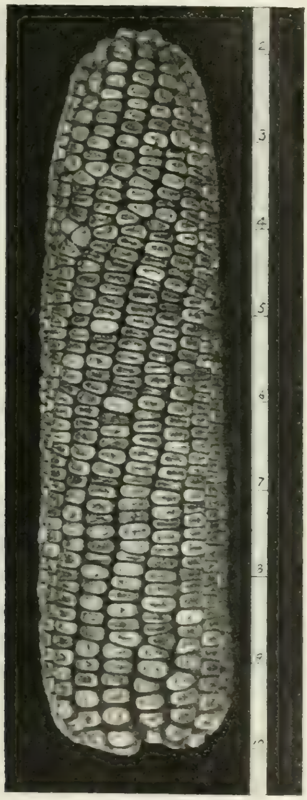
The best types of this variety are to be seen on the Manning River, these being with a few exceptions much superior to those grown on the Macleay River, a circumstance probably due to more care in selection. It is a good show maize on the cob, taking second place in the champion class at the Royal Agricultural Show in 1918. The shelled grain also makes an attractive sample in the class for medium yellow grain. On the Manning River this variety gave the highest yield (94 bushels per acre) in a test of sixteen varieties in 1917–18, and again at Mount George in 1918–19 amongst twelve varieties. It is not suitable for poor soil or for late sowing on the coast.

Gold Standard Leaming.

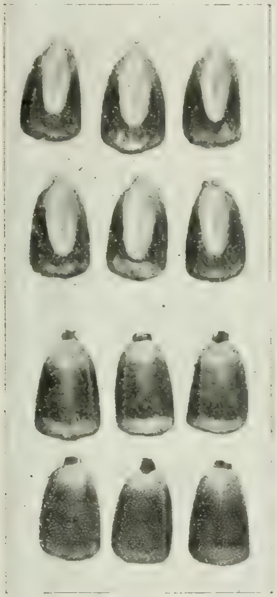
This variety was introduced by the Department into New South Wales about six or seven years ago from Ainsworth and Sons, seedsmen, Illinois, U.S.A., who make a special feature of breeding a few varieties of maize. It is not listed by many other seedsmen in that country, and although it has been tried in several localities in this State it has not yielded up to expectations except in one or two instances on the South Coast. It has been persevered with by Mr. George Lindsay, Horseley, Dapto, for many years, and he finds that it is very suitable for his requirements, in so far as it is fairly early, so that he is able to harvest the best ears for seed and then cut the rest for fodder. For the latter purpose—especially if sown more thickly than usual—the stalks are rather succulent and fine. It is earlier by a fortnight or so than the well-known Leaming, maturing in a little over four and a half months on the coast. It bears no resemblance to Leaming in type of ear or grain, but its field characters approximate this variety more closely. It seems to be very susceptible to leaf blight disease, and it is therefore desirable to sow it early on the coast. It has not yet been fully tested for early sowing in these districts, but late sowings of it have been a pronounced failure as compared with other varieties.

The stalks are comparatively fine and somewhat short, with a tendency to sucker, especially on rich soil. The ears are supported at a medium height by long, fairly thick shanks, which, however, allow the ears to turn down when nearing maturity. Only a single ear is usually borne on the stalk; the husk covering is fairly good.

The ears are generally cylindrical in shape and of moderate size, being 8½ to 9 inches long, about 7 inches in circumference, and weighing on the average about 13 or 14 oz. (standard size). There are sixteen or eighteen rows of grain, with a moderately smooth, shallow dent. The rows are generally straight and regular, but sometimes slightly curved. The butt is well rounded and the furrows between the rows medium to small, with the grain tight on the cob. The core is dark red in colour, and moderately small. The shelling percentage is fairly good.



Gold Standard Leaming.



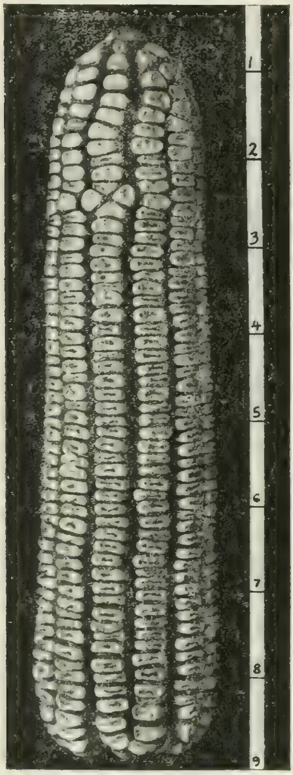
Gold Standard Leaming.

The grain is wedge-shaped, $\frac{9}{16}$-inch deep, $\frac{6}{16}$-inch broad, and fairly thick. It has a good bright yellow colour, with that of the small cap not differing sharply from the rest of the grain. The germ is large and broad, and the grain of medium hardness. It takes about 1,200 grains to weigh 1 lb.

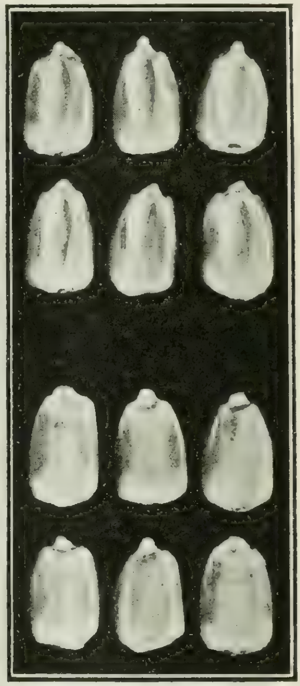
This variety is not being recommended by the Department for grain at present; further trials are being made with it for early sowing on the coast. It is, however, suitable for early fodder on the South Coast, more especially in the Illawarra district.

Giant White.

The origin of this variety is unknown, but it is most largely grown on the Macleay River (where it is known as Macleay White), on the Manning River (where it is mostly called Manning River White), and on the South Coast (where it goes by the name of Giant White). In all these localities it seems to be in favour because of its apparent ability to withstand dry conditions and to do fairly well on less fertile soils. White maize has generally a reputation for yielding best on poorer soils, but this reputation cannot be applied alike to all white varieties. For instance, Boone County White will not do well except on rich soils, nor does it yield well under dry conditions. Giant White requires to be more fully tested in comparison with other varieties under different seasonal conditions to determine its true value. One feature of it is that it cannot resist blight, and must therefore be sown early on the coast. It is a week or so later in maturing than Leaming, taking a little more than five months to mature on the North Coast. It is not a very suitable variety for fodder.



Giant White.



Giant White.

The stalks are of medium thickness and height, with little or no tendency to sucker. The ears are borne singly as a rule at a moderate height on the stalks, and with a short shank tend to remain erect while maturing. The husk covering is good, and the variety suffers little from wet weather. There is, however, a soft-grained starchy type of this or a similar variety, which has poor husks and is greatly affected by bad weather.

The ears are short and cylindrical, scarcely being beyond 8½ or 9 inches in length, though the circumference is 6¾ to 7 inches and the average weight of typical ears 13 to 15 oz. The dent is somewhat rough, but not very pinched; the rows number twelve or fourteen, and are mostly straight and regular; the butt is fairly well rounded, with a shank of small diameter, and the tips are generally well filled. The ears have rather wide furrows between the rows, and the core is small and white, which, with the deep grain, gives a high shelling percentage.

The grain is deep ($\frac{10}{16}$ to $\frac{11}{16}$-inch), perfectly wedge-shaped and straight sided—more so than would be expected with the wide furrows between the rows. The grain is medium thick, white, rather more pearly than too starchy, with a medium to small cap, and with a rather small germ for the size of the grain. About 1,000 grains go to the pound.

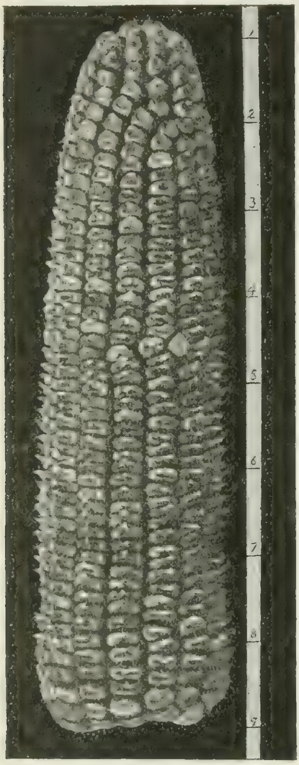
The yields of this variety in good seasons have been on the whole disappointing, but it is so largely grown on the Northern Rivers mentioned, especially for early sowing, that it will not easily fall into disuse unless it is proved to give yields in dry seasons below those of later-evolved varieties against which it is being tested. It may be that the depth of grain makes it more popular than it should be.

Goldmine.

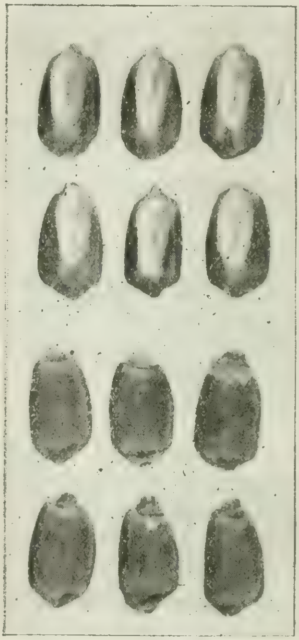
As the name implies this is a golden or yellow-grained variety of similar type or characteristics to Silvermine, the well-known white variety. Though an old American variety introduced here years ago, it does not seem to have survived in many districts. Mr. A. Louttit, Mullenderrie, Moruya, is, however, still a champion of the variety, which, he says, yields well on soils that are not too fertile, and in good seasons is capable of turning out a really good crop. He also favours it on account of its earliness and the succulence of the thin stalks, which put it in the same class as Gold Standard Leaming, previously described. Probably owing to being grown on the coast for so many years it has lengthened its period of maturity, being a week or so later than Silvermine, and taking over four and a half months for maturity. Like Silvermine, it is susceptible to blight if sown late, and it always does best for early sowing.

The stalks are not very tall, but slightly more so than Silvermine; they are fine and have some tendency to sucker. The ears are fairly low and, if not sown thickly, many two-eared stalks can be found in a good crop. The shanks are fairly long, and allow the ears to droop over well before maturity. The husk covering is open to some improvement, but the variety stands wet weather well on account of its early drooping ears. It would not, however, be resistant to weevil in the field on the North Coast.

The ears have a general tapering shape, with a standard weight of 12 to 14 oz., length of 8½ to 9 inches, and circumference of about 7 inches. The dent is very rough, with the upper edge drawn to a characteristic beak. There are sixteen or eighteen rows on the cob, with irregular grains somewhat common between the rows. The butts of the ears have the rows mostly irregularly arranged, but are well rounded with grain when the shank is removed. The furrows between the rows are fairly wide, and there is a slight tendency to looseness of grain on the cob, which should be remedied by selection. The core is small and of red colour, and the shelling percentage is rather high.



Goldmine.



Goldmine.

The grain is long wedge-shaped, about $\frac{10}{16}$-inch deep, $\frac{6}{16}$-inch broad, and fairly thin. It has a bright amber or golden colour, with a cap of medium size, and a large germ. It is medium hard and a pound will contain about 1,300 grains.

This variety has given poor yields on the North Coast for late sowing, though it has shown out better on the South Coast, especially when sown early.

(*To be continued.*)

The Pig Industry.*

H. W. POTTS, F.C.S., F.L.S., Principal, Hawkesbury Agricultural College.

PIGS multiply more rapidly, mature more quickly on less food, and produce more digestible flesh than any other animal. The increase among cattle is estimated at 80 to 90 per cent. per annum, sheep 100 to 150 per cent., and pigs from 1,000 to 1,800 per cent. It has been amply shown that pigs produce more edible flesh from a given quantity of food than other animals. It requires 13 lb. dry matter in the form of food (that is, the ordinary ration with the moisture removed) to secure a gain of 1 lb. of flesh in cattle; in a sheep it takes 8 lb. to 9 lb. for a gain of 1 lb. of mutton, but in the pig it only requires from 4 lb. to 5 lb. to produce 1 lb. of pork. In killing, sheep dress 55 to 60 per cent. dead weight, cattle 60 to 65 per cent., and pigs 75 to 80 per cent. The pig scores again in that the carcase contains more edible meat in proportion to bone than that of any other flesh-producer.

Pork and bacon contain a higher proportion of edible fat than beef or mutton; moreover, it is recognised by scientific authorities as being more digestible than other fat. In addition, it has been ascertained that more energy can be developed from 1 lb. of pork than from an equal quantity of mutton or beef.

Pigs can be bred, reared, and fattened on smaller areas than other forms of domestic stock. Bacon is the most compact and suitable form in which meat can be stored or transported.

When it is recognised that the pig possesses a voracious appetite, has a powerful digestive process, and will eat all classes of food available on a farm (much of which is unsaleable), it may be looked on as the scavenger of the farm and a most economic adjunct to farm life.

The important factor to success in pig-rearing is the person in charge. He or she should possess natural aptitude, sympathy, willingness, and enthusiasm for the work, as well as an intelligent knowledge of the animal, its habits and wants, and its care.

In Australia pig-raising has developed in five sections: (1) The large pig grazier, who breeds and feeds pigs by grazing on areas up to 2,000 or 3,000 acres; (2) the dairy farmer, who must secure means of profitably disposing of his skim milk, of which means the pig provides the best; (3) the mixed farmer, who has residues of an unsaleable nature on almost every form of crop, which the pig converts into a marketable product; (4) the suburban pig fattener who buys slips from the country farmer and secures cheap feed from the kitchen refuse in the hotels, institutions, factories, and other sources in and near the cities; and (5) the householder who fattens one or more pigs annually from the daily refuse of the home, orchard, and garden.

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* Notes of a lecture delivered before the Denman branch of the Primary Producers' Union, 30th July, 1919.

A number of breeds have been introduced to Australia, but so far only five breeds have successfully withstood the ordeal of acclimatisation. We unhesitatingly place the Berkshire first as the best dual-purpose pig. The Middle Yorkshire has established a reputation, and so has the American Poland China. In the purely bacon section, the Tamworth and the Large Yorkshire have shown a capacity for growing high-class bacon at a low cost.

The chief indications of quality in pigs are compactness of form, full development of hind and fore quarters, a good back, length and depth of side, with strong pasterns on both fore and hind legs. A quiet disposition is essential, with good handling qualities, and a healthy, vigorous digestive organisation. These, combined with a clean skin, fine hair, a neat, trim jowl and fine bones, provide the leading points, combined with the all-important qualification of being prolific in breeding.

It is of the utmost value to the pig breeder to commence the foundation of his herd with a pure-bred pedigree boar of striking individuality, correct conformation, and strength of build. He should have short neck and legs, long back, broad shoulders, big girth, fine quality flesh, skin and hair, and be active, with good temper and disposition. The teats should number at least twelve, and be evenly placed. The best evidence of a boar's usefulness is the size, thriftiness, and numbers of the litters of his family—not only of the litter he is selected from, but those he is responsible for. Prepotency of the boar is a marked characteristic in a good one; this means the power the animal possesses of impressing the progeny with his own conformation and quality. No boar should be used under 10 months old, and he should be kept separate from the sows.

In the selection of the sow, a well-bred animal has advantages over the common types. In all cases sows should be noted for a capacity to mature quickly; they should have a good digestion, robust active habits, gentle, motherly disposition, and great length and depth. They should also be clean in habit, have twelve to fourteen well-developed and evenly placed teats, and should show evidence of being good milk producers.

Special attention must be paid to the matter of feeding sows during the period of gestation, so as to avoid their craving to eat their young immediately after farrowing. Sows must be selected of good size, but not of a type that is likely to fatten during the period; they should exhibit strong milking capacity.

In feeding pigs, a good water supply, either natural or provided, is very necessary, with access daily to rock salt, charcoal or ashes, and (in districts where lime is absent from the soil) an occasional lime ration in the form of sterilised bone meal.

Concerning the main principles in feeding and stimulation of the rapid growth of pork in a pig, there is no doubt as to the advantage of open grazing. Possessing, as we do in this country, the advantage of having sweet nourishing natural grasses and herbage eminently suitable for producing a richly flavoured class of meat, the grazing method cannot but be profitable. Where good grazing, with dry shelter, shade, and a wholesome water supply, is selected, a saving of 30 per cent. can be effected as against sty feeding. The pigs, too, are more healthy, hardy and vigorous under grazing conditions.

Cooking food does not in any degree improve the fattening capacity of the ration; on the contrary, valuable nourishment is often lost in the process. Cooking is only justified in the case of potatoes or to render palatable mouldy foods, such as damaged wheat, kitchen refuse, and such like.

Among cultivated crops, lucerne gives the highest return as a flesh and milk producer. Rape (grown alone or with barley or oats) or tares combined with a cereal give a balanced ration when fed off. In winter and early spring rape often gives attractive returns when grazed off. Experience gained during the past few years at Hawkesbury Agricultural College in growing Long Red mangolds for pigs indicates that, if sown in February and March at intervals on small blocks, the first of the crop is ready for use in December, and a cartload of sweet, succulent tubers can be split in halves and distributed daily over the piggery paddocks and through the sties. The animals evince a strong partiality for this class of root crop; the sugar content is high, the flavour is rich, and the juicy matter affords the pig a tasty class of moist food that takes the place of green food. The supply is kept up daily until April. This variety of mangolds grows well on any medium class soil, and gives a crop ranging from 45 to 60 tons to the acre.

The value of all by-products from the dairy, such as skim milk, buttermilk and whey, must not be overlooked, as these provide a daily basis of a most profitable nature in the pig's ration, the resulting pork and bacon being noted for quality, richness and condition. No dairy farmer can afford to ignore the pig, and if he conducts his affairs on a sound business basis he should receive 25 per cent. of his nett profits from the piggery alone annually. This food has to be supplemented with starchy foods, such as barley, oats, wheat, maize, or other grains. In flesh production 10 gallons skimmed milk equal ½ bushel of maize. This should give from 4 lb. to 5 lb. weight of pork. In all cases a balanced ration is necessary in order to save feed and gain a relishable class of flesh, streaked suitably with lean meat. It is well to remember that 60 lb. of maize or wheat should produce 8 lb. to 10 lb. pork, always providing that suitable changes are made to alter the flavour, and keep up the appetising and relishable character of the food. It is wise to change the food frequently. When kept too long on one kind of food, animals fail to assimilate it, and lessened daily increase consequently results.

The value of legumes in providing a class of food that is adapted for producing red-flesh, muscle, tendon, hair, skin, tissue, and such like, apart from fat, is well known. This class of fodder includes lucerne, clovers, peas, cowpeas, peanuts, beans, tares, meat scraps, meat meal, tankage, and boiled rabbits. Each season and its crops must be profited by, so that there is always something growing for the pigs. The variety that can be so gained is instanced by the pumpkins, marrows, squashes, Turks' caps, and grammas available throughout the summer.

Concerning diseases of pigs, the breeder is warned of the ease with which swine fever can be transferred from infected areas to clean ones. Any carelessness or indiscretion may mean a calamitous loss. The most effective way of avoiding the disease is the rigid application of ordinary cleanliness and good drainage and sweet yards, and the constant and uninterrupted admission of sunlight to the yards and the sheds.

Tuberculosis is invariably spread through skimmed milk coming from a tuberculous cow or herd. The micro-organism responsible for the disease is readily destroyed by heat. The proper method is to heat the skimmed milk in a boiler for twenty minutes at a temperature of 180 degrees Fahrenheit. Should the skimmed milk be needed for feeding at once, no further treatment is necessary, but should it have to be kept it is necessary to cool it down rapidly to 60 degrees.

TREATMENT FOR LICE ON HORSES.

IN the treatment of lice on horses it is advisable first of all to clip the affected animals all over, burning the hair removed. Careful singeing will then kill most of the remaining eggs and nits, after which the application of a kerosene and soap emulsion, made as follows, will be found effective :—

Dissolve one pound of ordinary hard soap in one gallon of boiling water; when thoroughly dissolved stir in one pint of kerosene to make the emulsion.

It is advisable to keep the horses in the shade after the dressing has been applied. The repetition of the dressing after an interval of five to eight days is recommended, in order to kill the parasites hatched out from the eggs that have resisted the first dressing.

Another very convenient method of dealing with lice on horses is to wisp the animals with a warm solution made by dissolving 1 oz. of sulphurate of potash in a gallon of hot water. This should be applied every four or five days for three or four dressings. The disinfection of the stables, rugs, &c., should not be forgotten.—VETERINARY OFFICERS of the Stock Branch.

VOLUME FOR WEIGHT OF LUCERNE HAY.

DESIRING to erect a barn for storage of fodder, and doubtful as to what capacity to make it, a Lismore farmer recently inquired as to the weight of a cubic yard of lucerne hay (unpressed) The weight of hay in a stack varies considerably according to its quality and condition when stacked, replied the Department. About 400 cubic feet will, as a rule, weigh 1 ton, and a cubic yard, therefore, at the same rate, about 151 lb. If the hay is stored in the shed for a fairly long time it increases in density, and may give 1 ton to about 300 cubic feet.

The Agricultural Department and the Farmer.*

THE ADVANTAGES OF CO-OPERATION.

A. H. E. McDONALD, Chief Inspector of Agriculture.

REVIEWING the activities of the Department of Agriculture since it was established thirty years ago for the purpose of assisting farmers in the production of heavier and more profitable crops, and in the fight against the many enemies of plant and animal life, one cannot but be impressed by the number of difficulties that have had to be met, and by the substantial measure of progress that has been made. The fullest influence and value of such an educational factor as this must primarily depend upon the extent to which it gains the confidence and co-operation of the man on the land. That was an aspect of things that was perhaps not fully appreciated in the earliest days, but there has at least been plenty of evidence more recently that farmers recognise that the Department has something valuable to tell them, and also that the Department, on the other hand, recognises that it can only reach its maximum usefulness with the co-operation of the producer. Such an appreciation of one another is the only basis, in fact, upon which progress can be made.

Glancing backward to the beginnings of the Department, one cannot but remark that the work of the past few years would have been quite impossible had the apathy persisted which at first marked the farmer's attitude to the Department. In those early years, farmers, though often very active in the agitation to get experiment farms established in their districts, rarely made use of the farms, and were often but little influenced in their practice by what was being done on them. Some able scientific men were enrolled in the ranks of the Department, and a few farms (including Hawkesbury Agricultural College) were early established, but the researches carried out were of a kind that for long was little understood or appreciated. Valuable work was nevertheless going on—work the importance of which we have not even yet perhaps accurately estimated. In particular there was the inconspicuous devotion of Mr. W. Farrer to his self-imposed task of raising high-yielding wheats of superior quality (ably continued in recent years by Mr. Pridham), and there was the educational progress at the College, where was proceeding the training of many officers who have more recently added greatly to the Department's strength.

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*Notes of an address delivered before the Agricultural Section of the Royal Society, 8th September, 1919.

The Farmers' Experiment Plots.

The results obtained at the farms during those early years, though little heeded by farmers, served to convince officers that there was ample room for improvement in the farm practice of the State generally, and that there was a need for some more direct means of demonstrating to farmers the soundness of the methods advocated. It was in 1908 that the first forward move on that line was made, it being decided in that year to carry out experiments in conjunction with farmers, with the object of demonstrating the value of the newer agriculture.

Mr. G. Valder, with a staff of five inspectors, was placed in control of the work. The farmers' experiment plots, as a system, were not too readily understood at first, and difficulty was experienced in inducing farmers to take up the work, it being found necessary to pay those who agreed to plant plots for the work actually performed by them as some guarantee against the loss that was anticipated. Under those conditions 151 series of plots were arranged for in the first year. The results were so good, however, that it was soon quite unnecessary to continue the system of payment for the work performed, and there presently arose a keen desire to have plots in more places than the Department could arrange for. The number of plots was increasing rapidly each year when the war broke out, and the prompt enlistment of many officers for the front made the position that had then been reached difficult to maintain. More recently, the conditions have improved, and there are this year 373 series of plots in existence, comprising a total of 1,378 acres. The popularity of the system is now so great that the demand for plots is beyond the capacity of the staff, and the Department is still working with farmers who conducted plots at the initiation of the system.

The Value of the Plots.

The establishment of these experiment plots has been followed by most gratifying results; our officers have been brought into close personal contact with farmers, and the latter have learnt that they can look to the Department for assistance and sound advice. The plots have also demonstrated to farmers on their own properties the value of fallowing, the utility of fertilisers, and the superiority of improved varieties of crops. Among the results of the system has been a very considerable increase in the use of fertilisers, while the newer varieties—particularly of wheat—have almost altogether superseded those in common use at the time of the establishment of the system.

The Department can justly claim that these varieties have been of immense value to the State; not only have they increased the average yield in the favoured wheat districts, but they have enabled the extension of grain-growing to districts in which it could not be contemplated when only the older varieties were available. In some districts, perhaps, the results have not been so good as they might have been, but this is largely due to the enormous area which has to be covered by each inspector. The average size of the districts is about 15,000 square miles, each with railway systems running up to 500 and 800 miles. That such excellent results have been obtained under the circumstances is also due in an important degree to the valuable assistance rendered by the farmers who are conducting the experiments, by disseminating among their neighbours the knowledge they themselves have gained from the plots.

Pure Seed with Farmers' Help.

The success of the experiment plot system may be ascribed to the excellent work previously done at the experiment farms, and to the enthusiasm and capability of the officers entrusted with it. For the sowing of the plots, good seed is essential, and the progress made would have been impossible but for the new varieties that had been previously produced. Much of the success, in fact, may be attributed to the high quality of the seed—particularly of wheat and oats—supplied from Wagga and other experiment farms.

The position in regard to maize and other seeds, such as sorghum (which easily become interpollinated), was more difficult, however, for it is obviously impossible, when a number of varieties are grown on one farm, to maintain the purity of each. The number of experiment farms at which maize can be grown is also limited, and it was therefore decided a few years ago to enlist again the co-operation of farmers. With a view to ensuring that pure seed should be available of varieties for which room could not be found on the experiment farms, arrangements were made for small quantities of pure seed to be supplied to growers who were prepared to take the precautions necessary to the maintenance of the purity of the strain, and an officer of the Department now pays periodical visits to those who undertake this work, for the purpose of giving instruction in the selection of desirable seed. A gradual improvement in quality has thus been effected, and many of the farmers engaged in the work have gained considerable reputation as producers of high-class seed. The foundation seed was in some cases selected from old-established varieties, while many of the best American sorts have also been introduced in this way. The work in the experiment plots has shown almost exactly what varieties are suitable for each district, and in the establishment of pure-seed growing a constant supply has been ensured of the best sorts in accordance with the results obtained on the plots. The pure-seed growers have done valuable work, and the Department for its part seeks to support them by referring to them inquiries for the varieties they are growing.

Among grasses brought under trial in the plots, particular mention may be made of Sudan grass. This plant was only introduced to this country by the Department four or five years ago, but it came rapidly into prominence, and during last season—despite the unfavourable conditions that obtained—it made remarkable growth, particularly in the inland districts. The grass is certainly very promising, and will probably prove a very valuable crop to the wheat-grower for rotation purposes. Some wheat land does not produce much feed during summer time, but Sudan grass appears to thrive at that time of the year, and to provide excellent food for stock.

The Agricultural Bureau.

Steps were taken some years ago by the Department to organise the farmers, and for this purpose the Agricultural Bureau was established. Under that scheme farmers meet monthly for the purpose of discussing agricultural matters, and members are encouraged to read papers, while officers of the Department, whenever possible, give lectures and demonstrations on subjects of local interest. Although the work was considerably interfered with by the war, many active organisations have been built up, and much valuable work has been done. The movement is purely educational, farmers meeting regularly to exchange views and help each other. Every assistance possible is given by the Department, but the success of the scheme is obviously dependent upon the secretaries and members of the different branches.

It is unnecessary to say that the Department still desires the close cooperation of the farmer, in order that still greater improvement and progress may be made, and that the goodwill and confidence which characterises the farmers' present attitude may continue to increase.

SOME RECENT PUBLICATIONS.

COPIES of the undermentioned publications may be obtained by farmers free of cost, on application to the Under Secretary and Director, Department of Agriculture, Sydney :—

FARMERS' BULLETINS.

92. Apple and Pear Growing, 63 pages; by W. J. Allen.
121. Water on the Farm, 42 pages; by F. B. Guthrie.
123. Egg-laying Tests at Hawkesbury Agricultural College, 17th Year's Results, 26 pages; by E. F. Whitbread.

MISCELLANEOUS PUBLICATIONS AND LEAFLETS.

Advice to Dairy Farmers, 4 pages; by L. T. MacInnes.
Feeding Stall for Cows, 4 pages; by C. Pedersen.
Classing Farmers' Wool Clips, 8 pages; by J. Wrenford Mathews.
Prevention of Blow-fly Attacks on Sheep by Spraying, 3 pages; by A. H. E. McDonald.
Treatment of Sheep under New England Conditions, 6 pages; by L. Judd.
A Handy Lick-trough for Sheep, 3 pages; by L. Judd.
Pit Silage, 8 pages; by A. H. E. McDonald.
Value of Silage for Dairy Cows, 3 pages; by R. H. Gennys.
Lucerne for Wheat Farmers, 5 pages; by A. H. E. McDonald.
The Creation of a Vineyard, 7 pages; by H. E. Laffer.
Humus and Green Manuring, 4 pages; by F. B. Guthrie.

Popular Descriptions of Grasses.

[Continued from page 639.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE ERIOCHLOA GRASSES.

ALTHOUGH the Eriochloa grasses are only a small genus consisting of a few species, they are extremely common throughout the tropical regions of the Old and New Worlds.

Bentham, the famous botanist, distinguishes two species native to Australia, but the differences between the two are so minute, and they often run so closely into one another, that an ordinary observer would certainly call them the same grass. Bentham has classified the two species under the names *Eriochloa annulata* and *E. punctata,* whereas other botanists classify them all under the one name, namely, *Eriochloa polystachya.* There is not the slightest doubt, however, that as regards their habits of growth, two, and sometimes three, distinct strains can be distinguished in the field. On the black soils of Coonamble, for example, one strain grows just like a sturdy oat plant, with broad leaves and thick succulent stems; another strain has narrower leaves of a lighter green colour, though still with thick succulent stems; while a third strain has a rather weak drooping plant, not carrying nearly such a quantity of feed as the others. On close examination of the plants, botanical differences are practically imperceptible, the only distinction noted being the relative hairiness of the flowering stalks (see Fig. 2).

The Eriochloas can be distinguished by their inflorescence. It somewhat resembles that of the Panic grasses, but a closer examination of each seed will show that there is no small outer glume as in the Panic grasses. The glumes (husks) of the seed are covered with fine hairs that give a glistening silvery appearance, sometimes with a purplish tinge. The long points to the glumes are also distinguishing characteristics.

The Eriochloa grasses are widely distributed throughout New South Wales, but are less common on the tablelands than the coast or interior. They will grow on practically all classes of soil, but river flats or volcanic soils suit them to perfection. Some very fine Eriochloas can be seen on the Clarence River flats; but generally speaking, they are plants of a weak type on the coast. On the plains of the interior they will grow to a height of 4 or 5 feet.

They appear to be most common on land that has been cleared, and partially or wholly cultivated. This was evidenced particularly on the Yanco Irrigation area, where they were hardly noticeable until settlement under the irrigation scheme had resulted in extensive cultivation, since which

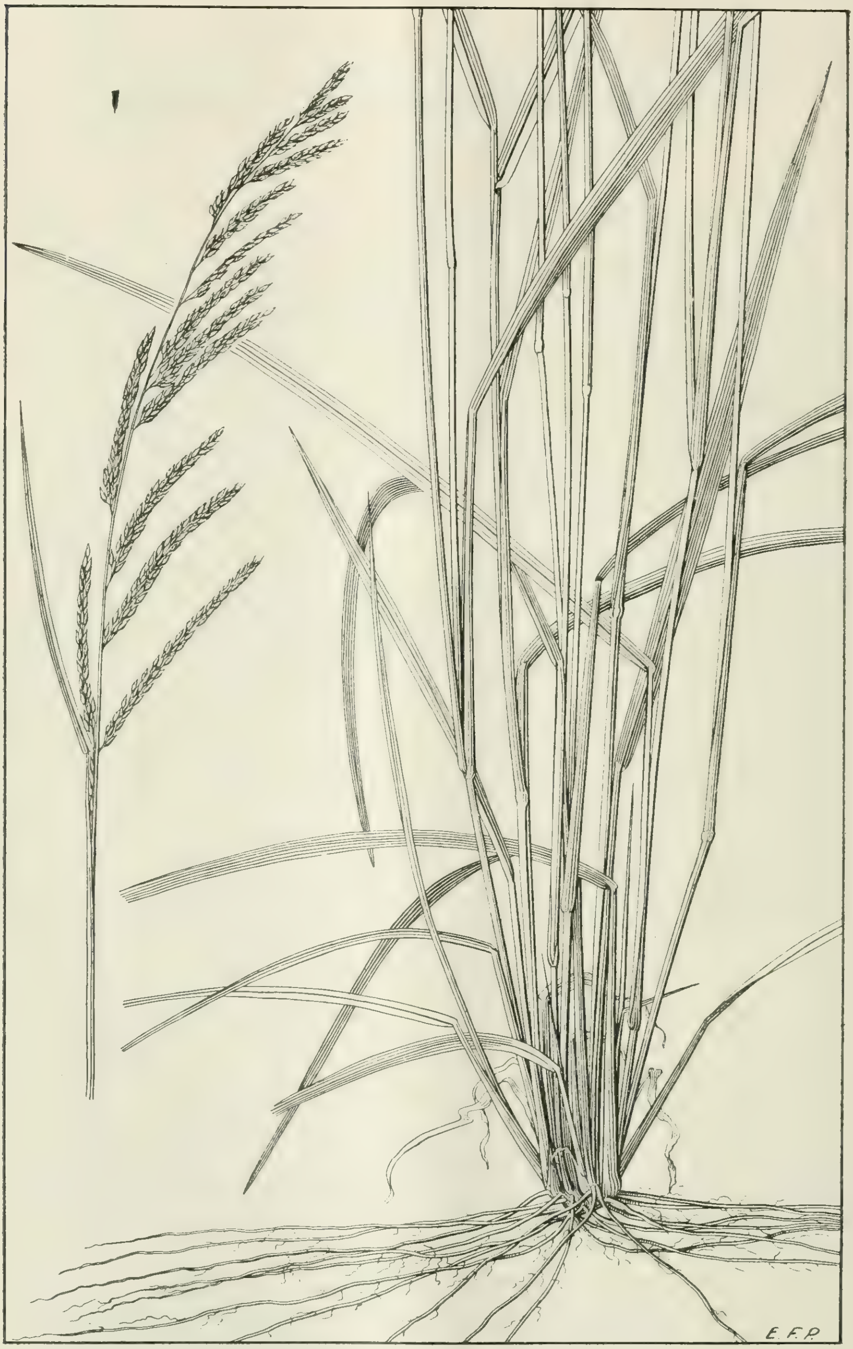

Fig. 1.—*Eriochloa polystachya.*

A typical plant of this variety as it grows in the interior.

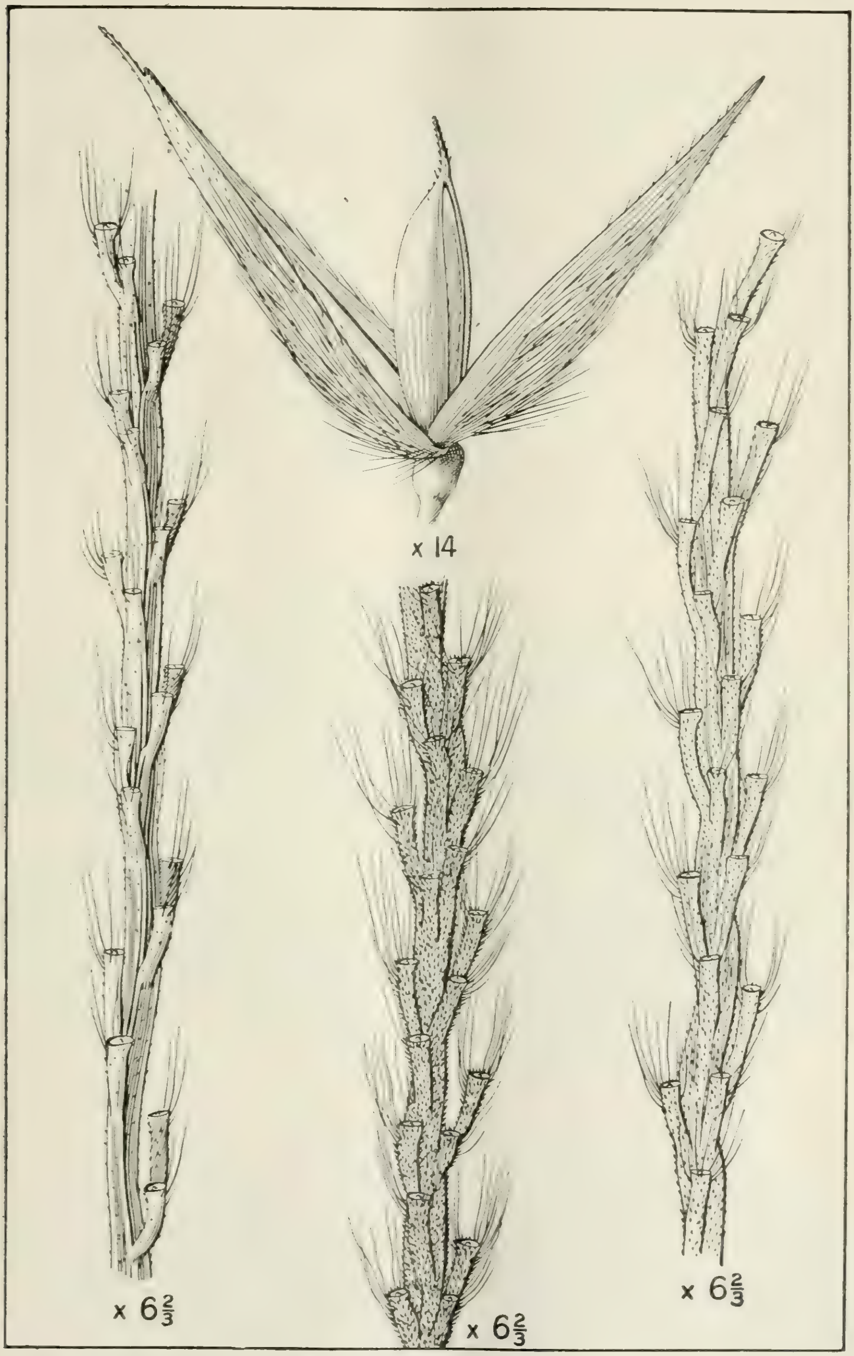

Fig. 2.—*Eriochloa polystachya.*

Flowering stalks of three distinct strains of this variety. Note the variations in the hairiness—the only perceptible *botanical* difference. In the field, however, the leaf growth of the three strains is very distinct. Note the point to the seed glume or palea.

time they have become extremely common along the ditches and in fallowed paddocks generally. The extra supply of water, of course, has also favoured them to a large extent.

These grasses have not many popular or local names. "Plains grass" and sometimes "Early Spring grass" have been applied to them. The latter term is hardly a good one, as they are not particularly early, and make their best growth in the summer and autumn.

The palatability and nutriment of the Eriochloas are of a very high order, some Yanco settlers putting them before all others, native or introduced. Samples of excellent hay made from them have been exhibited at Sydney shows

Unfortunately the seed ripens unevenly, and also germinates badly. The laying down of Eriochloa pastures, therefore, is practically impossible, and the most dairy farmers can do to extend the area of these excellent grasses is to scatter ripe seed over the paddocks. Such a procedure would be an immense benefit to any poor pasture.

THE MERITS OF THE SOUTHDOWN CROSS.

A RETURNED soldier, who had taken up a 230-acre holding under the Closer Settlement Act, and had asked the Department's opinion as to the merits of the Southdown crossbred for lamb-raising, was replied to as follows :—

The Southdown breed of sheep is very suitable for lamb-raising. It produces a superior class of mutton, although in carcase weight its progeny is not as heavy as that of some of the coarser-fleshed, earlier maturing breeds. Longwool-Merino crossbred ewes are much preferred to pure Merino ewes where the breed is used for cross-breeding.

In the Departmental tests, the Southdown, crossed with both Lincoln-Merino, Leicester-Merino and Border Leicester-Merino ewes, has produced a very shapely lamb. When sold in the open market, lambs of these crosses have constantly brought the highest price, as based upon so much per lb. for their flesh, but taking the value of the carcase as a whole, the greater weights which have been obtained from the Dorset Horn cross have enabled these latter to yield the highest return per head.

THE SCHOOL GARDEN.

"A SCHOOL garden is not a good laboratory without weeds and insects, fertilised and unfertilised plots, plants too close to each other and too far apart, in short without the exhibits of mistakes and their corrections. The proper use of the school garden is not to produce big cabbage-heads, but well-developed children's heads and bodies too. Hence in the school garden there ought to be plots for single pupils or small groups of pupils, and larger experimental plots for which the teacher and the school as a whole are responsible."—JOHN DEARNESS, M.A., Ontario, in the *Agricultural Gazette of Canada.*

Farmers' Experiment Plots.

POTATO EXPERIMENTS, 1918–19.

South Coast and Southern Highlands.

R. N. MAKIN, Inspector of Agriculture.

THE Department had the co-operation of the following farmers in carrying out a series of potato experiments during the past season :—

J. H. Martin, Pambula.
J. Chittick, Kangaroo Valley.
T. A. Howard, Crookwell.
O. E. Silk, "Woodbine," Nimmitabel
Plumb and Wray, Crookwell.
Cunningham Bros., McAlister.
S. Troy, Mittagong.
J. White, Moss Vale.

The season proved one of the worst experienced for many years, owing to the absence of rain. The crops on the highlands suffered more than those on the coast. The latter, being planted much earlier, formed up before the dry summer weather could seriously affect them. The returns from the Pambula plot are satisfactory, but that cannot be said of the others, except that under such adverse weather conditions it was remarkable that any potatoes were harvested at all. Failures, however, have to be reported from the plots at Nimmitabel, McAlister and Moss Vale.

Pambula.—Soil, alluvial deposit formed from granite and basalt; ploughed during winter and again before planting; sets sown in drills struck out with the plough on 28th August, 1918; drills 3 feet apart; sets, 15 inches in drills; harvested 21st January, 1919. Rainfall, 634 points.

Kangaroo Valley.—Soil, alluvial deposit from sandstone; ploughed during winter and again before planting; drills struck with the plough; 3 feet between drills; sets, 15 inches in drills; sown 9th October, 1918; harvested 11th February, 1919. Rainfall, 935 points.

Mittagong.—Soil, basalt, hillside, red and black soil; situation too dry under the weather conditions; ploughed during the winter and again before planting; rows 2 feet 9 inches apart; sets, 15 inches in rows; sown 17th September, 1918; harvested at different periods during February and March. Effective rainfall, 373 points.

T. A. Howard, Crookwell.—Soil, basalt, red in colour; ploughed during winter and again at planting, when sets were ploughed in, in drills about 2 feet 9 inches apart; sets, about 15 inches in drills; sown 23rd November, 1918; harvested, 3rd July, 1919. Effective rainfall, 532 points.

Plumb and Wray, Crookwell.—Soil, basalt, red in colour in some parts, white in other parts; situated on a hillside; ploughed during the winter and again at planting time, when sets were sown about 2 feet 9 inches between drills, 15 inches in drills; sown 14th November, 1918; harvested during July. Effective rainfall, 532 points.

TABLE showing Results of Variety Trials.

Variety.	S. Troy, Mittagong.	J. H. Martin, Pambula.	T. A. Howard, Crookwell.	Plumb and Wray, Crookwell.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Early Manistee ...	1 0 1 12	4 17 1 20	0 14 0 13	3 5 1 20
Factor	1 2 0 6	....	....	2 6 2 20
Magnum Bonum ...	2 5 1 12	....	....	3 17 0 8
Carman No. 1	0 17 2 20	5 6 2 0	....	2 5 2 20
Satisfaction	2 0 2 0	4 6 3 12	0 19 1 4	1 7 1 14
Brownell's Beauty ...	2 2 0 8	....	....	2 11 0 6
Up-to-date	....	5 1 2 16	1 15 0 10	2 2 3 2
Manhattan	....	5 2 2 8	....	2 10 3 16
Coronation	....	....	1 7 1 18	1 6 2 12
Queen of the Valley ...	....	....	1 15 2 24	3 5 0 0
Surprise	....	....	1 2 3 12	....

All plots received the usual harrowing after the plants came up, and when required the scuffler was run between the rows. In some cases germination was not good on the plots, especially at Crookwell. Early Manistee was bad in this respect, as was also Coronation.

The use of superphosphate at 4 cwt. per acre in every case brought about an increased return over the plot untreated. Superphosphate costs £5 2s. 6d. per ton f.o.r. Sydney, so that 4 cwt. per acre represents a little over £1, and, taking potatoes at the high values they have been bringing on the market, the manurial proposition is a good one. One factor which is not evident from the figures—and a real one—is that a greater number of marketable potatoes are obtained from plots manured, even though the total yield may not be greater than from an untreated plot. More attention is being given to manurial experiments in the coming season.

TABLE showing Results of Manurial Trials.

Manure per acre.	J. H. Martin, Pambula.	T. A. Howard, Crookwell.	S. Troy, Mittagong.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Superphosphate, 4 cwt.	5 1 2 16	1 7 2 20	2 0 2 0
Superphosphate, 2 cwt.	4 15 0 16	....	....
No manure	4 0 0 16	1 3 3 10	1 8 2 0
P7, 3 cwt....	4 10 0 0	1 7 1 18	1 10 1 12

P7 consists of superphosphate and bonedust mixed together in equal quantities.

A trial of deep planting as against shallow was conducted on Mr. Howard's farm at Crookwell. A plot was sown 6 inches deep, yielding 4 tons 7 cwt. 3 qrs. 12 lb. per acre, whilst alongside another, sown 4 inches deep, yielded 3 tons 9 cwt. 1 qr. 14 lb. per acre. The same variety of potato was sown in each case. Deep planting is advocated in order to ensure a good root system, well established in the moist soil, and also so that the tubers may be formed in such a position in the soil as to escape the ravages of the potato moth and of Irish blight.

In the trial of mature as against immature seed, the season was unfortunately against satisfactory results, and little is to be learned from the return, as they are fairly even. If there is a difference, it favours the immature seed, for, judging by the appearance of the plants while growing, the immature seed promised to give the best results, the plants appearing much stronger. The immature seed, and also the mature seed, was selected at Nimmitabel from the same crop, the immature seed being dug while the plants were quite green.

RESULTS of Trials of Mature *v.* Immature Seed.

Variety.	J. Chittick, Kangaroo Valley.		Variety.	Plumb and Wray, Crookwell.	
	Mature.	Immature.		Mature.	Immature.
	t. c. q. lb.	t. c. q. lb.		t. c. q. lb.	t. c. q. lb.
Early Manistee	2 8 3 12	3 6 2 0	Dalhousie	1 8 3 20	1 12 0 16
Satisfaction ...	1 9 3 12	1 9 0 16	Coronation	2 4 0 22	3 0 1 2
Manhattan ...	1 5 2 24	1 6 0 16	Langworthy	2 2 0 21	2 1 1 20
Up-to-date ...	1 6 2 8	1 7 1 20	Queen of the Valley	3 1 0 8	2 10 0 25
Carman No. 1	2 3 2 24	1 19 3 12	Surprise	2 4 0 2	3 0 1 2
Factor ...	1 5 2 24	1 6 2 8			

In the variety trials Early Manistee produced good results where the germination was satisfactory. Magnum Bonum—a late variety largely grown in the Crookwell district, and frequently sold on the market under the name of Snowflake—is a reliable potato for the highlands. It is a white-skinned variety, characterised by the purple shoots noticed in sprouting the seed. The dry season seemed to suit Surprise, Coronation and Queen of the Valley, for some tubers of these varieties were very fair as regards size. Brownell's Beauty, a variety that it is very difficult to procure true to type at present, gave fair returns. Factor is a potato that will be grown more in the near future; it is a white-skinned variety, inclined to be round. Up-to-date is a suitable variety for the highlands. The true Carman No. 1 is perhaps a better variety.

At Crookwell several members of the Cotta Walla branch of the Agricultural Bureau sent along some varieties of their own selection to be sown alongside the varieties sown by the Department. This is a test that has always produced a good deal of interest into the experiments, and that is to be commended, although it would be better to have all the seed acclimatised. If this scheme was carried out more extensively, no doubt some high yielding strains would be located. Crookwell farmers are cordially invited to bring, or send, potatoes of their own growing and selection for test on the next plots. Their help in this direction is valuable to the Department. and also materially important to themselves.

FARMERS' VARIETIES under test at Mr. Howard's Farm, Crookwell.

	t.	c.	q.	lb.	
Mr. J. Wray—Coronation	1	0	0	10	per acre.
Mr. G. Butt—Brownell's Beauty	1	14	2	26	,,
Mr. C. Price—Snowflake	1	17	2	24	,,
Mr. J. Plumb—Up-to-date	2	8	0	24	,,

SILAGE AT COONAMBLE EXPERIMENT FARM.

OUR experience with silage at this farm during the past four months of scarcity has furnished undeniable evidence that as a practical, effective and cheap feed for sheep it is beyond reproach. The facts are so convincing that they should be known to every farmer in the State.

Commencing on 18th March, 1,330 sheep (chiefly crossbred 4-tooth ewes were fed on silage until 16th July—a period of seventeen weeks. During this time 211 tons of silage were put out, the objective being to supply as nearly as possible 3 lb. per sheep per day. The quantity may seem large. but a silage ration must necessarily be much heavier than one of, say, lucerne or wheaten hay, for silage contains a good deal of moisture, for which allowance must be made when making comparisons with other stored fodders.

It has been said that 1 lb. of silage per day will keep sheep alive, and no doubt this is true, but the animals will become so weakened that they will require a lot of nursing when grass again becomes plentiful. The sheep at Coonamble were kept in fair condition throughout, and consequently when grazing improved they simply jumped ahead. It must be remembered, too, that silage is cheaper than almost any other feed—for it does not cost much more than 7s. per ton on the farm—and under these circumstances one can afford to treat the animals fairly well. In our case it meant only £74 as the actual cost of the fodder used in hand-feeding 1,330 sheep for seventeen weeks, or under 1d. per head per week. Even if it be admitted that the cost of making silage is usually a little higher, and that the labour of carting out, &c., has to be added, it is still probable that sheep can be hand-fed with silage at very little, if anything, over 2d. per head per week.

During the whole period the sheep were confined in a 20-acre paddock, but care was taken to ensure that a fresh feeding ground was chosen each day, the result being that at no time did the paddock or any part of it become offensive. The feeding time was spread over several hours daily, in order that, as far as possible, waste by soiling and trampling down should be avoided. It is possible to bundle out five or six loads in a couple of hours and then to knock off, but the loss by waste will be heavy; it is much better to feed slowly and regularly. A plentiful supply of salt should be available when silage is in use in this way, and also ample drinking water.—W. R. COLWELL, Manager.

A Colony of Bees.

W. A. GOODACRE, Senior Apiary Inspector.

PROBABLY in no form of insect life does the talent for domestic economy attain a more intelligent eminence than among the bees; the story of their activities is a fascinating fairy tale "come true." Quite distinct from the study's financial aspect—the point of view of the bee-keeper for profit—the history of the hive, the busy duties of its inmates, and the laws which guide them are well worth investigation.

A colony of bees consists of one queen, a large number of workers, and usually a fair number of drone bees. The queen is a developed female, the workers undeveloped females, and the drone is the male bee.

The Queen Bee.

The work of the queen bee is to lay all the eggs, and she may therefore be described as the mother of the colony. She is raised from the same larvæ that would produce a worker.

For instance, if a queen is removed from a normal colony when conditions for breeding are favourable, the bees would, within twenty-four hours, prepare to raise another, by feeding a number of very young worker larvæ on specially prepared food called "royal jelly." This food is given in abundance, and will cause extra development. To provide for this the bees build the cells out later to about ¾ of an inch past the level of the ordinary brood and extend them in width. The queen thus raised from the larvæ usually issues from the cell on about the fourteenth day, though the condition of the weather may cause the period to vary slightly. When a queen emerges from the cell, she will very quickly destroy any remaining cells that are in an advanced stage, unless the colony desires to swarm, which seldom occurs in such an instance. Though the foregoing should not be taken as a desirable method of replacing queens, in many cases a similar one is used where a better system is not available; that is, by placing a frame of selected brood with a queenless colony, or by introducing a queen from a populous colony for the purpose of raising cells to replace unsatisfactory queens in the apiary. In the case of a beginner the brood placed should contain some eggs, as his knowledge of the right age for larvæ would be limited.

Virgin Queens.

A queen is termed a "virgin" from the time she issues from the cell until successfully mated with the drone. Strange to say, this virgin queen could lay eggs that would produce live drone bees, but in order that the queen may lay eggs that will produce worker bees it is necessary for her to be fertilised by the drone. The mating usually takes place in about five days after issue from the cell. Selecting a nice sunny day if possible, the young queen issues from the hive and mates with the drone whilst on the wing. The queen absorbs the organ of the drone, which has the effect of killing him immediately, and she then returns to the hive, where she will commence to lay in a few days. In most cases the queen will be laying within ten days from the time she issues from the cell, though the weather conditions sometimes cause the time to vary. A queen may even be mated late in the autumn and not lay until the spring.

A virgin queen is very difficult to find in the hive on account of her small size and shyness, but a change takes place shortly after successful mating, for the queen develops in a wonderful manner, due to the presence of eggs forming in the abdomen. When this takes place the queen is usually easily discovered.

The life of a queen bee is about three years, and only once during that period is she mated. Despite the average period of a queen bee's life, it is usually advisable to replace her after two seasons' work.

Drone-laying Queens.

A drone-laying queen is one that has not been successfully mated, or (on some occasions) a queen that has lost the power to fertilise her eggs. The former state is usually brought about by some abnormal condition of the queen, or an unfavourable condition of the weather during mating time. For instance, a queen will at times issue from a cell with damaged wings, being thus prevented from taking the wedding flight. This queen would naturally be a drone-layer. At other times unfavourable weather may prevent mating, and after a fair period the queen will lay, but the issue will, in such case, be drones. A novice will often clip a virgin queen, causing her to become a drone-layer. Others sometimes leave an excluder on the entrance for an unlimited period, which has a similar effect if there is a young queen in the hive during the time.

A drone-laying queen can be detected by the appearance of the brood, the caps of the worker cells being abnormally bulged, and having practically the shape of a ·22-rifle bullet. Her eggs are usually laid irregularly, and their condition and appearance are quite abnormal when compared with the brood of a good queen. Drone-laying queens should be destroyed, about two frames of her brood being then removed and replaced with about the same quantity of normal brood, obtained from good Italian stock. This brood should contain at least some eggs and larvæ. After twenty-four hours a ripe queen cell should be placed with the colony, or a queen introduced that is not considered valuable. In case neither cells nor queen are obtainable, all the brood should be removed in the first instance, and the bees allowed to raise cells from the brood introduced until a cell or queen raised under better conditions is available to give them. A good method is to unite a nucleus containing a laying queen if one is on hand.

The brood of a drone-laying queen is similar in appearance to that of laying workers, and it will therefore be necessary to note the distinguishing features of each case. The apiarist usually has a knowledge that a queen was, or should be in the hive, whereas in the case of laying workers the colony must have been queenless for a considerable time. This knowledge, combined with diligent search, will place the apiarist on the right track.

Worker Bees.

The name "worker" is self-explanatory, and their wonderful organisation is clearly apparent when it is seen how smoothly a colony will progress in normal times with a population of probably 20,000 of them. Among a few of the duties performed by them daily during normal times are the gathering of nectar, pollen and water, the feeding and attending of the larvæ, and the cleaning of the hive. Besides these things, they circulate the air through the hive, guard the entrance from attack, and secrete wax and build comb.

Remarkable self-sacrifice is shown by the bee. When crippled, she will throw herself over the alighting board; and when swarming, the colony which worked so hard to build its comfortable home, sallies bravely forth to start all over again, leaving its hard-earned stores for the younger generation. It would be impossible to find greater energy, organisation, self-sacrifice or love of home than that which marks the worker bee.

Nectar, the liquid gathered from the flowers which undergoes a change in the honey stomach of the worker bees, is subsequently stored in the comb and becomes "honey." Pollen is the nutritious food which is gathered from the flowers and carried on the legs of the bee. It is stored in the cells and is principally used, after being mixed with honey and water and partially digested in the chyle stomach of the worker bee, for feeding larvæ.

Laying Workers.

The statement that the worker bee is an undeveloped female and a sister to a queen, and that a virgin queen can lay eggs that will hatch live drone bees, will clearly show why it is possible for a worker to lay eggs that will produce live drone bees. It is only in an exceptional case, however, that a few workers will try to take up the position of a queen and be accepted as such by the colony, and usually when a colony is without a queen for a considerable period. If, therefore, attention is given to the colonies either by introducing a queen or a frame of brood containing larvæ and eggs soon after they become queenless, the trouble will be averted.

The brood of laying workers is similar in appearance to that of a drone-laying queen, but the eggs are laid in a very erratic manner, and it is not uncommon to see a dozen in one cell and perhaps thirty in a queen cell cup. The bees, noticing the abnormal condition, will often endeavour to supersede. The cells raised for this purpose are much longer than the ordinary queen cell, but the bees have no chance of raising a queen from drone larvæ, and therefore there is no issue from the cells raised. The knowledge or suspicion that the colony has been queenless for quite a long time, combined with a diligent search, will convince the apiarist that laying workers are present. It is practically impossible to detect the bees that are laying.

A colony containing laying workers is almost invariably in a weak condition, therefore it is best to remove all their brood and unite them with a populous colony. To do this, it is best to wait until the bees have finished work for the day. Carry the colony to the one it is to be united with, remove the cover of the populous colony, and place upon it a sound sheet of newspaper; then place the laying worker colony on top, leaving the bottom board on the ground. Regarding the brood combs that were removed from the colony, it is best to extract the honey and melt them up, for if this brood is placed with a good queen the bees will often supersede their queen, and the risk is not worth while.

The Drone Bee.

The drone is the male bee and his term of life is generally regulated by the workers. For instance, if the colony is progressive they are raised and allowed to remain in numbers; but when times are not progressive the majority are driven from the hive, killed or starved. The sole purpose of the drone is to fertilise virgin queens, but in the breeding of bees he has just as important a part as the queen, and the effect of his peculiar breeding makes his part even more beneficial to the apiarist. For instance, a pure Italian queen, mated with a drone from black stock, would produce crossbred worker bees, but the drones in this case (not being affected by the mating) would be pure Italian. If, however, a queen is raised from this crossbred stock then the drones would be crossed. It will be seen, hence, that the drone has a grandfather, but no father.

This knowledge that the first cross from Italian stock will produce pure drones is of considerable assistance to those apiarists who are improving the standard of breeding in their bees. They can be sure that these drones will be equal to those raised from pure stock, so far as any effect they will have on future breeding is concerned.

THE POISON PERIOD OF SORGHUM.

SORGHUM should not be fed to cattle until the ears are out, but in drought times, when the crop is backward, it may be fed after having been cut and allowed to wilt. The poisonous properties are most in evidence in young shoots or second growth, or in the early growing period before coming into head. Injury is seldom caused when the crop is hand-fed, all cases of poisoning being those where cattle have broken into the growing crops, or have been turned in to graze.—J. A. ROBERTSON, Herdmaster.

NATIVE OR WILD ONION (*Bulbine bulbosa*).

THIS plant has often been reported as poisonous (ran the Department's reply to a recent question on the subject). It belongs to the lily family, and is a constant visitor during the spring in the pastures of the interior. Unless very hungry, stock never eat it, but in a dry season any green herb is likely to be eaten, and its presence in pastures is therefore very undesirable. It is a weed which could well come under the list of noxious plants in every shire of the State.

The Packing of Fruit.

[Continued from page 656.]

W. J. ALLEN and W. le G. BRERETON.

Methods of Handling Fruit while Packing.—When sizing machines are not used, the point that most exercises the mind of the one in charge of the packing is how to accomplish even sizing with the least amount of handling and expense. If the fruit to be operated upon only contains two or three sizes, it can be turned direct on to the bench, and where a packer is given a fair length of bench to work upon—say, not less than 4 feet—with the trolley carrying the case so that it will move easily, sufficient fruit of a size is generally exposed and within reach to pack a case without too much time being wasted searching for the required size. The fruit taken from the bench to pack one case will expose a fresh lot, allowing another case to be packed, and so on till the bench is cleared. Towards the clean-up of a bench there may be difficulties in quickly picking up sufficient fruit of a size to pack a case. In such an event more fruit should be turned out on to the bench at once, as a packer loses time if he has to grope about for fruit of the right size. When working in this way, the main thing is to start with the size which comprises most of the fruit exposed on the bench at the time. Start at one end of the bench, and keep on taking all the exposed fruit of the size on which you are working. As it becomes necessary to reach forward for fruit of the right size, the trolley—being on wheels—will move forward without any special attention, bringing more fruit of the size wanted within reach. When the case is full, pull back the trolley and start again.

If out of practice, it is sometimes difficult to judge which size is most in evidence, and one starts on a size and finds that there are not many of it exposed. In such circumstances do not pull fruit from underneath the heap, as that will only cause damage to it and loss of time. Put the case down and start another size; probably your judgment will be better the next time, and later, sufficient of the first size having accumulated, it will be possible to complete that case. Should the run of fruit to be operated on be irregular in size (that is, contain very many different sizes), there will be very little of any one size exposed and within reach of the packer; packing will be very slow, and it will be impracticable to complete a case without searching for fruit from the under part of the heap on the bench. With a fairly irregular run of fruit it will be found easier to turn out on to the bench only one picking box of fruit at a time (keeping a supply close to the packer), and to pack a size from this, at the same time working any too large to one side and any too small to the other; then to turn out another picking case of fruit, and continue in this way, packing one size and making two heaps, each containing perhaps two or three sizes. When the heaps have accumulated sufficiently they can be operated upon as described for a regular run of fruit.

When very irregular runs are to be operated on, it will be found more satisfactory and quicker in the end to sort the fruit to size before packing. When sorting, it is not necessary to attempt to divide the run into many sizes. Three are generally ample, and when these are placed on the bench for packing it will be found quite simple to pack two distinct sizes from each of the three. It is difficult to sort fruit accurately to size, and all that is necessary prior to packing is to reduce the number of sizes, so that there are always enough of a size exposed on the bench for the packer; provided this is so, the closer sizing is simpler when done during packing.

Sizing Machines.—It is natural that amongst old-time packers there should be a prejudice against sizing machines, because their use seems to show a lack of skill; but now that skilled labour is difficult to secure, machinery will have to be used to take its place. One of the chief difficulties to be overcome in this class of machinery is to eliminate bruising. An Australian machine has been in use for some years at the Department's Bathurst orchard, where it has been found that, if carefully operated, it will size satisfactorily and not bruise to any greater extent than when fruit is run out of a picking apron into a picking case, or from the case on to a bench. This, of course, refers to fruit in firm condition. From such machines it is generally possible to pack two distinct counts or sizes from each shoot; but, as has been pointed out, this is no drawback, the only object being that there should be always plenty of fruit of a size exposed before the packer, and if there are only two sizes on the bench this must be so.

Moreover, very accurate sizing might prove a drawback, as a machine must break them up to specified sizes and, as has been previously explained, a specified size may not pack out satisfactorily; if, on the other hand, such specified sizes have sufficient length of range, then a shorter range, or two shorter ranges, can be chosen that will pack. There will possibly be odd fruit that has to be packed with that from the next size shoot, either larger or smaller.

Wrapping and Lining Paper.—Wrapping helps to hold the fruit in its place, lessens bruising, with apples especially prevents stalk injury, checks evaporation—so that wrapped fruit will not so rapidly shrivel (go "sleepy") as naked fruit—and, where odd fruit goes bad in a case from disease or other cause, assists in preventing the trouble from spreading.

All higher grades of apples and pears should be wrapped, and it is probable that when paper falls to reasonable prices it will be found advantageous to wrap high quality peaches. It is usual to wrap oranges for export, but it has been found that oranges grown in our coastal districts will sometimes sweat and mould if wrapped and packed fresh from the trees; indeed, under these conditions even the use of lining paper checks the circulation of air, sometimes favouring the development of blue mould.

Lining paper was originally used when wrapping was not practised, but, with the exception mentioned above, lining paper is an advantage even when fruit is wrapped, as it provides an additional protection to the fruit touching the sides of the case. It must be remembered that when the lid is brought down to its place for nailing, the bottom should also spring, so that the whole body of fruit moves to some extent, and those fruits that are touching the sides of the case must necessarily be rubbed in the movement.

Nailing.—From the remarks made on the subject of the tops and bottoms springing equally and thus dividing the pressure, it is plain that provision should be made for this to take place while the lid is being brought into place for nailing. Undoubtedly this is best done in a press. The box rests on the thickness of its end only, leaving the remainder of the bottom free; the clamps of the press only bear on the ends of the lid, and when the pressure brings the ends of the lid down to their place, both the top and bottom are free to spring or bulge. Nailing is then carried out while the press holds the ends of the lid firmly in their place. If a press is not used, one or both ends of the case should rest on battens, so as to leave the bottom free to spring while the top is being nailed down. Under these circumstances two batttens should be spiked to the floor, so that for Australian cases the inside edges are 18 inches apart, and for Canadian cases 20 inches apart. Along one of the battens a cleat should be nailed to act as guide, so that the case can be placed in correct position without loss of time. These battens should be placed handy to the packer, so that as the cases are completed they can be placed on it in position for the nailer.

Nail Strippers.—Strippers have been used very little, if at all, in this country, and to the skilled nailer they would probably be of no assistance, but in most of our districts central packing sheds are not yet in existence, and the highly skilled nailer is seldom found. To the unskilled nailer, whether he is making cases or nailing down packed fruit, it is likely that the nail stripper would be of use in enabling him to become more speedy at his work. Different makes of strippers are advertised in the American fruit publications, the main features being that the nails feed from a hopper on to a long slot, which is occasionally shaken, thereby causing them to hang from the slot point down, so that they can be drawn from it as required by the nailer, who then has them in his fingers, with the points all the one way.

The Use and Misuse of Wood Wool.—It is obvious that if a little wood wool is placed in the bottom of the case before packing, and some is placed over the top of the fruit before nailing down, the fruit has a soft pad instead of the hard top and bottom with which to come in contact. The use of wood wool in such a manner is quite legitimate, and when the case is nailed down the wood wool (or other packing) will not be within the top or bottom line of the case, except just where it projects into the spaces between the fruit. Where fruit is packed naked for local market, wood wool is liable to give a dusty appearance, the small particles from it adhering to the fruit, and under these circumstances paper shavings are preferable. On no account should wood wool or other packing be used as a padding to take up space in the case or to keep a pack high, for then it is taking space that should be filled with fruit, and true measure is not being given.

Stencilling.—Cases should be stencilled or marked on the opposite end to that carrying the maker's guarantee, and should be placed so as to read correctly when the case is stacked on one side. The grower's name or brand, or that of the packing house, looks better if in larger type than the remainder of the marks, and can, if a stamp is procured, be impressed on the case by the manufacturer of the case, or can be stencilled on during a slack time before the busy packing season starts. The name of the variety, quality, and count should also appear. All these marks should have a fixed place, and their relative positions should always be maintained, so that the salesman and buyer can quickly pick them out.

It will be found that rubber stamps are far handier and quicker than stencils for putting on the name of the variety, quality, and count mark. The counts can be taken from the chart that is to be followed, and the rubber stamps made accordingly. They can then be placed in rotation on a rack, with their respective numbers placed over them, so that they can be quickly handled without time being lost in searching for the right one.

Stacking.—Cases after they are nailed down should not be stacked on the spring or bulge—that is, on the original top and bottom—but either on the sides or ends. It is obvious that if they are stacked one on top of another on the spring or bulge, the fruit in the lower cases will have to carry all the weight of the cases above them. This applies also to the hinged lid case, and is well recognised in some of our fruit districts, but quite disregarded in others.

Construction of Case.—The ends or heads of the case should be thick enough to stand the pressure and nailing without splitting; if thicker, the weight and overall length of the case is increased unnecessarily. The required thickness will vary—with the make of case and the class of timber used—from ⅝ inch to ¾ inch. The timber of the sides should be stout enough to allow the fruit to be drawn up firmly into place without them springing appreciably either then or when the case is being nailed down. Here, again, the thickness will be governed by the class of case, and the timber used will vary from ⅜ inch to ⅜ inch full.

In the Australian bushel case it is preferable to have the sides in two pieces only, though to reduce the cost three pieces may be allowed. But whether there are two or three pieces, they should be of approximately equal width. If a narrow piece is used it will spring during packing or nailing, so that the fruit may be cut on the edge of the abutting piece—a very objectionable condition. There are also decided objections to the whole side springing during packing or nailing, for either the pack will be low or the fruit will be too large for the count; moreover, with the sides springing to any extent, the fruit will be liable to be bruised when the cases are stacked on their sides.

The tops and bottoms should be cut fine enough to spring when the case is being nailed down, without (as previously explained) causing undue pressure on the fruit. Their thickness, again, is determined by the make of case and the class of timber, varying from ¼ inch to 5/16ths inch. One-sixteenth of an inch may seem trifling, but the difference it will make in the flexibility of the timber is surprising. A lid or top in one piece is the easiest and quickest to handle when nailing down, but the two-piece is more flexible than the one-piece of the same thickness. If the nailing is done in a press, the latter should be adapted to suit the two-piece lid if such a lid is being used.

THE MANURE VALUE OF BROOM MILLET ASH.

ASH from Broom Millet, from results obtained from recent investigation in this laboratory, is fairly high in potash and would be fairly valuable on this account. The analysis resulted as follows:—

	Per cent.
Moisture	2·59
Insoluble	57·23
Oxides of iron and alumina	3·73
Lime	6·11
Magnesia	3·53
Potash	15·53
Soda	1·07
Phosphoric acid	4·67
Sulphuric anhydride	2·46
Chlorine	0·77
Carbonic acid	2·40
	100·09
Less oxygen corresponding to chlorine	0·17
	99·92

The unit value of potash at the present moment is about 15s., so that the present market value of the above as a potash manure would be about £11 per ton. Under normal conditions, which will no doubt soon prevail, its value would be about £3 15s., per ton. No comparison with bonedust is possible, because bonedust contains no potash, though it contains roughly about 4 per cent. nitrogen and 20 per cent. phosphoric acid. The millet contains no nitrogen and only about 4½ per cent. phosphoric acid.—F. B. GUTHRIE, Chemist.

A SUGGESTED PASTURE MIXTURE.

REPLYING to a correspondent on the Lower Hunter who inquired as to what good fattening grasses he might plant on a "rich cultivation flat, sandy loam, recently under maize crop," the Department stated that a mixture of Rhodes grass, cocksfoot and white clover had given good results on similar situations. The seed should be sown in September at the rate of 4 lb. Rhodes, 10 lb. cocksfoot, and 4 lb. of the clover per acre; if desired, 1 lb. of lucerne seed per acre might be added.

THE FODDER VALUE OF TREES.

REPLYING to a question from a pastoralist who had been cutting scrub for cattle and sheep, the Veterinary Officers of the Stock Branch gave the following general information :—

Boonery (*Heterodendron oleæfolium*) is quite a useful fodder plant, but at times it becomes highly dangerous owing to the formation of prussic acid, and it should therefore be used with care, and, if possible, it should not be fed to hungry (empty) stock, nor alone.

Bumble (*Eucalyptus populifolia*) is generally held to be of little value as fodder.

Belah (*Casuarina lepidophloia*) provides poor fodder ; it contains too much tannin. On analysis it shows a fair nutrient value, but apparently it is not well digested.

Kurrajong (*Sterculia diversifolia*) is one of the best of fodder plants.

Supple-jack (*Ventilago viminalis*) is valuable as fodder, being sometimes held to be better than Kurrajong. It shows a fair nutrient value on analysis.

Mulga (*Acacia aneura*) is a very good fodder plant. Every effort should be made to conserve mulgas, kurrajong and supple-jack. The tree should be lopped, not cut down. On analysis mulga shows a very fair nutrient value, but as a single feed it is too nitrogenous.

Wilga (*Geijera parviflora*) is another good fodder plant.

Box (*Eucalyptus hemiphloia*) is not a high-class fodder plant.

It should, perhaps, be added that the terms "good" and "valuable" are used in a purely comparative sense in the above connection. At the best these trees are, of course, merely famine fodder.

THE POTASH VALUE OF GIDGEA ASH.

A SAMPLE of *Gidgea Acacia* wood ash was recently subjected to analysis with the following result :—

Potash	0·25 per cent.
[Equal to sulphate of potash, 0·46 per cent.]	
Phosphoric acid...	0·36 per cent.
[Equal to tricalcic phosphate, 0·79 per cent.]	
Lime	40·3 per cent.
[Equal to carbonate of lime, 71·89 per cent.]	

Even at the existing high price of potash the value of the sample as a potash fertiliser was only about 4s. per ton, while the impurity of its carbonate of lime (containing over 22 per cent. of sand and insoluble matter) made it of less value from the point of view of that ingredient than ordinary agricultural lime.

A note on this ash will be found in the *Agricultural Gazette*, vol. viii, p. 868.—F. B. GUTHRIE, Chemist.

The Future of Poultry Feeding.*

W. H. PAINE,

Manager, Animal Foods Department of Metropolitan Meat Industry Board.

In his address on balanced rations before the Poultry Conference last year, Mr. H. W. Potts raised the important question of chemical analysis, pointing out that there were a good many things to consider before it. Digestibility is one of these issues, and to it too little attention has been paid in the past, for in feeding stock, be it beast or bird, it is not so much the amount of food consumed which is of importance, as the amount of nutrition which the digestive process can extract for the use of the body.

In the purchase of foodstuffs, digestibility must largely determine their values, especially so in the case of concentrates such as meat, bone, blood, linseed, and the like. In the past much has been called and sold as meat meal in this State which had no right to claim such a name; and, again, much has been fed to poultry that has been previously sold as fertiliser and proved unsatisfactory for that purpose. To meet the need for a meat feed the "B and B" fertiliser put up by the State Abattoir at Homebush has been made available to poultrymen at a price below that at which it has been sold for fertilising purposes, though all the time it was sold as manure and not as poultry food. It is true that it contains much that has feeding and egg-producing values, but it also contains 50 per cent. of mineral matter that, instead of being a help to the bird in these respects, becomes a load on its digestive organs, and uses up energy in its expulsion as useless matter.

Here, then, is a point at which digestibility has an important relation to the price paid for foodstuffs. The fertiliser referred to contains from 35 to 40 per cent. of protein, but owing to its being subjected to a certain high temperature, at least a high proportion, probably one-half, is indigestible, so that it really becomes expensive in use, although cheap in bulk. If 50 per cent. is deducted for the mineral matter and another 20 per cent. for indigestible proteins, only 30 per cent. of useful materials remain, and some of this will consist of fibre. Therefore, in comparison with a meal in which practically the whole of the protein contents are digestible, the cost from a feeding value point of view, instead of being £7 10s. per ton, is nearly £24 per ton. Moreover, freight has to be paid on the useless portion of the bulk, and there is the attendant disadvantage of feeding unsuitable matter to the fowls.

The Manufacture and Use of Meat Meals.

The Metropolitan Meat Industry Board has established its Animal Foods Department for the purpose of manufacturing such foods for poultry and pigs as meat, bone, blood, &c. These products (really meat meals) will be clean and wholesome, made from plucks and carcase portions, and will contain none of the refuse which, though used in the manufacture of manures, might be objectionable from a feeding point of view. It is expected that the new meat meal will contain near to 70 per cent. of crude proteins and 60 per cent. of digestible proteins, and it will therefore have three times the feeding value of the fertiliser, and will contain very little indigestible substance.

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* Paper read at the Poultry Conference at Hawkesbury Agricultural College, 14th June, 1919.

The pig meal which it is proposed to turn out will be a different product to the poultry meal, but it is expected that it will be as important to pig farmers as the poultry meal is to poultry farmers.

The main difference in digestibility mentioned above is one of process. In the manufacture of manure, speed is a matter of prime importance, and high temperatures are employed, which render much of the matter more or less insoluble to the processes of digestion; besides this, much is put into the manures which has already been through the digestive organs of the slaughtered animals, and which has, therefore, lost its value as food. The day of these crude feeds is past so far as meat concentrates are concerned, and in a very short time a meal that will commend itself to the industry in quality and price will be before the public.

The proper method of using meat and blood requires explanation, in view of the common, but entirely useless—even dangerous—practice of boiling meat meals before using them.

A properly prepared meat meal is subjected, during the process of manufacture, to a temperature three times as great as that of boiling point (that is, 300 deg. Cent.), so that all that cooking can do has been done before it reaches the poultryman. The objectionable feature of re-boiling is that the rough-and-ready method of boiling in open coppers is likely to give rise to a poison that has a deadly effect on fowls. Even when livers and heads are boiled, the coppers should be washed out with boiling water and well scrubbed as soon as each day's cooking is finished; but in boiling meat meals nothing of value is accomplished, and a good deal of risk is run.

The proper way to mix meat meal and blood or other concentrates may be stated thus:—If say, 400 lb. of mash is required and 6 per cent. of meat is being fed, take 24 lb. of meat meal—that being the portion required for 400 lb. (dry weight) of mash—mix it with 24 lb. of pollard, and pass it through the hands by kneading it to and fro several times; then add this mixture of pollard and meat meal to the bulk, and knead it again several times to ensure even mixing. Do all this before adding the water. Uneven mixing may result in all sorts of bowel disorders, and will cause scours among those birds in the flock which get an overdose. The application of boiling or hot water when mixing does not in any way improve the food values of the meal, but it has the power to produce a pleasant smell in good sweet meat, and to bring out the stench of "B and B" manures. As some of you know, warm food has a pleasant "nose," and as a result is more palatable, but the food values remain the same.

A word of warning needs to be sounded about following instructions in regard to the quantity to use. To say 6 per cent. by weight does not mean 6 per cent. by measure; meat, if good and pure, should be much heavier than bran and pollard, and to add 6 per cent. by measure may be to add 10 to 12 per cent. by weight. Bowel disorders and scours are sure to result when the ration is so carelessly made up, the meat being blamed for what is, after all, disregard of instructions.

Possible Substitutes for Bran and Pollard.

So far as the less concentrated foods are concerned, the future is not so assured, for with the increase of the industry the bran and pollard shortage will become more acute, and a wider range of feeds is required to meet the demands of poultry and other agricultural requirements. In what direction we are to look for relief is as yet somewhat uncertain. At one time a good deal was expected from lucerne and lucerne meal; but close attention to the ruling prices will at once show everyone that, while lucerne embodies the class of food that is required, the cost of feeding will be increased by its use, and anything that has that effect cannot be regarded as a solution of our difficulties. This statement does not refer to feeding green lucerne grown on the farm, because where water is available it is one of the best investments possible for reducing the cost of feeding.

From my knowledge of the industry, gathered at close range on many farms in this State, the poultry farmer himself has not tried very much to relieve the cost of feeding. He has rather entered into a policy of condemnation of millers, produce men, the Department of Agriculture, &c., at a time when much could have been done to relieve the shortage of food by growing more green food on the farm. This laxity is not entirely general, but it is more general than it should be.

In the feeding of green foods some undesirable practices are to be seen on many farms. The method of handling green feed is not all that could be desired. Large quantities are cut and laid in the feed shed, often being left long enough to heat and turn yellow, and to set up a strong smell of decay before it is fed to the birds. This is one of the worst forms of feeding possible, for the moulds or fungi which are formed are calculated to derange the digestive organs and to cause lung troubles. Besides this, the eggs laid by the hens carry a mustiness which make them an inferior article of food.

During the past summer the shortage of water was a big drawback, of course, but some of the more energetic men managed to have a fair supply of green food, while others in the same localities made no attempt to relieve the situation, and the dry or long-keeping foods, such as bran and pollard, were used in greater bulk as the result. This, together with the requirements of the dairy industry in such dry periods as that of last summer, has made the food problem more acute, and has directed our attention to the provision of other foods to blend with or take the place of wheat by-products. Relief may be obtained by the use of the by-products of other processes. Hitherto, wheat by-products have been our mainstay, because they are suitable for food without any further preparation, but there are many by-products that are destroyed or wasted which, if treated, would do much to overcome our food shortages.

The main difficulty is the transport of the crude roughages to a factory where they can be processed to give a nutritive content of sufficient value to cover the cost of manufacture and redistribution.

I may mention that among the items to which I refer are the by-products of the sugar industry and of starch manufacture, cocoa by-products, brewing wastes, and the residue of the various oil-extracting mills. It may be that some of these materials are poor in food values, but if they can be produced cheaply to form a base, the higher food values can be added in the shape of some relatively cheap concentrates.

Recent inquiries into the possible use of legumes with a cheap roughage have given most encouraging results, and there will be further research in the next year or two by the Animal Foods Department, as it is suggested that the Metropolitan Meat Industry Board should extend its activities to the use of roughages and vegetable concentrates that can be blended with the animal concentrates now available at Homebush.

Some mention has been made of late of prickly pear as a means of relieving our poultry food supplies, but all the facts are against the serious consideration of this weed. First of all, it is a poor food, with only 0·4 per cent. of protein, 8·9 per cent. carbohydrates, and 0·2 per cent. fat. Further, from the handling of 100 tons of pear only 16 tons 1 qr. of dry matter would remain, and only 9 tons 3 qrs. would be crude food. The cost of evaporation would be at least £20 per ton for a food with only one-fifth the value of wheat bran. The transport over long distances by freights, which are always more costly than water carriage, and the need of a movable factory to follow up the clearing, make it an impossible food; and it seems to me that, whatever future use prickly pear may have, it will not be to relieve the poultry food problem.

Experiments with Large and Small Rations.

Just before the war, feeding experiments were carried out by William Goodwin, of the South-Eastern Agricultural College, Wye, in Kent (England), to test out some of Professor Kellner's assertions regarding digestive action in bulky and meat rations. Professor Kellner's contentions were:—

1. A large ration which was in excess of requirements gave depressed digestion.
2. A small ration caused a more searching action by the digestive organs to obtain all the nutriments possible.
3. Concentrates in due proportion increased digestive effectiveness.
4. A one-sided addition of carbohydrates caused a marked depression.

The results of these tests were as follow:—

1. Where the ration was in excess of requirements, the food passed through the digestive tract without having all the nutrition taken from it, and it had the effect of rendering the digestive organs slow

and inactive to some degree, because the required nutrition was obtainable without effort; and it also showed that more nutrition was taken up than was required by the animal. This was stored in flesh and fat in the body. The effect that an over-large ration has on the laying hen may be in one of two directions—she may become fat, in which case it will prevent high egg-production, or it may be passed out by the bird as useless. That is a matter of the bird and her hereditary tendency, for coarseness or a flesh-forming tendency is as much an inherited character as is high egg-production. It may be taken as a fact that it is almost impossible to fatten a bird when in full lay; it is the contention of Mr. Hadlington that it is the poor layer that puts on fat, because she is not producing eggs, and you may be certain that when a bird is laying she is not over-fat. Some birds will not fatten because they will, from their own choice, refuse to overfeed; others will pass the food through, taking what is required and wasting the remainder. It is important to watch overfeeding, just as much in the bird that does not fatten as in the one that does, because in feeding concentrates, particularly blood, if they are not digested fermentation goes on as it passes out of the body, and bowel disorders result. This same remark applies to a lesser extent in meat, linseed, gluten feed, &c.

2. Where the small ration is fed, or where the ration contains a small amount of nutriment, the digestive action is very complete, and the organs themselves are active and in good order; but, of course, small rations will not produce eggs in big numbers, because the body has to maintain itself before making provision for egg-formation. Mention of a small ration is not made to suggest its adoption, but to show that the digestive agents are healthier and more searching when overfeeding is not practised. The aim of the poultryman should be directed to keeping the appetite keen, while at the same time satisfying the bird's hunger.
3. The protein concentrates have the capacity of keeping the bulk within reasonable limits, and in these tests it was found that they increased the digestibility of all the foods consumed and minimised the depressing effects of large quantities of nitrogen-free substances.
4. The one-sided addition of digestible carbohydrates causes a greater or less depression of digestibility, which will be more marked in hot weather than in cold, when the body requires more warming matter to make up the difference of body temperature to that of the air temperature; but, taken as a general rule, when starch foods are fed in undue proportion, more is eaten per head and less of the bulk is digested, which is proved by the fact that some of the easily-digested starch foods pass out in the dung.

All this brings us once again to the question of the balanced ration, which may be called the economic ration, because it means the mixing of food in such a way as to supply the correct amount to feed the body and to maintain the maximum supply of eggs, while at the same time it aims to get digestive action at perfection point, so that as little as possible of the nutritive values contained in the food shall be wasted in the manure.

The feeding of meat to fowls is contested by some poultrymen, who claim to produce as many eggs without it as others do with it. Such, indeed, may be the case; for, providing the birds kept are of a good laying strain and disinclined to become fat, they will eat a larger bulk of food, extract the correct proportion of proteins and a corresponding balance of carbohydrates, &c., and waste those carbohydrates which are in excess of the balance required. So, besides meat being useful in making up the balanced ration, it goes towards producing a cheap mash.

In all these matters relating to our future food supplies the price must play the bigggest part; digestibility comes next, because in that lies the purity and the suitableness of materials for poultry foods. The future will make calls on our resources which will require the united effort of all keen poultrymen, and I hope that the joint work of the Animal Foods Department, assisted by all of you and by the Agricultural Department, with its vast store of information and energy, will in a very short time give new assurance to the men who have been industrious enough to pull through the hard times of the past.

To Start Bee-keeping.

A satisfactory method for the beginner desiring to embark in the bee-keeping industry is to purchase from a practical apiarist about two colonies in factory-made hives. A study should also be made of text-books, and the knowledge so obtained will usefully supplement the practical experience gained with the colonies. As the student's knowledge increases the number of colonies may be augmented by way of small purchases. A large initial outlay is unwise and unnecessary; about £10 will cover the cost of the two colonies, smoker, veil, a small extractor, uncapping knife and text-book.—W. A. Goodacre, Senior Apiary Inspector.

The Pine Tree Aphis (*Cermes pini*).

A branch of *Pinus insignis* from the North Coast, apparently attacked by some fungus or insect, was recently submitted by the Forestry Commission.

The Government Entomologist reported that the branch was infested with the pine tree aphis (*Cermes pini*, Koch), a very common introduced aphis which is widely spread all over the country, and which kills or damages a great number of pines. The trees are often infested when in the nursery, and care should be taken that all young trees are dipped in kerosene emulsion before they are sent out, or at any rate planted out. On large trees there is no known method of getting rid of the pest.

Vineyard Notes for October.

H. E. LAFFER, Viticultural Expert.

Endeavour to have the soil in the vineyards well broken down by the cultivators, and free from weeds. The growth will now be well forward, and a close watch should be kept upon the vines in order to detect signs of disease. At the risk of being considered an alarmist, it is necessary to point out again the grave danger which will arise should conditions prove favourable to downy mildew and black spot. It is the former which is the more to be dreaded, because of the rapidity with which it spreads. This disease is all through the County of Cumberland, the Hunter and other districts, and a serious outbreak may mean disaster to the grape crop.

A very close watch should be kept upon the weather, as showers will doubtless serve to develop one or both diseases. It is a wise precaution to give the young growth an early spraying when it is a few inches in length. In its early sappy stages, the growth is very susceptible to fungoid diseases, and therefore every precaution should be taken right from the start.

As a precautionary measure a spray of Bordeaux mixture, 6—4—40, should be given when the growth is 4 to 6 inches long. If black spot was prevalent in the past year, it would be well to spray at an even earlier period. A second treatment should be given some ten to fourteen days later, or sooner if the weather promises to be rainy. A critical period arises at the time of flowering, and although spraying when the vine is in flower is not considered advisable as a rule, it would be wise in the event of rainy conditions prevailing.

Indications of the disease are first manifested by the light coloured patches in the tissue of the leaf, followed in the course of a few days by the white, downy patches on the under surface. Where the infection has taken place the appearance of the white spores on the leaf is the signal for a fresh spraying; the young and unattacked foliage is thus protected from attack when they are dispersed. It must not be forgotten that the treatment is purely preventive, and once the infection has taken place, the only thing to do is to try and prevent a second attack by the spores produced from the first.

The same spraying serves to destroy both downy mildew and black spot, but it must not be looked upon as a cure for oidium. The last-named is of an entirely different habit, being external in its growth while the other two are internal. For this reason the fungus is easily destroyed even after its appearance has been noticed. It is wise, however, to be well on time and to have the proved remedy, sulphur, on hand to deal with the disease. Taken in time, oidium can be checked by dusting with fine sulphur.

That downy mildew can be overcome with Bordeaux mixture was amply demonstrated at Narara in the past year. Although it was prevalent throughout the season and the conditions were favourable for development, spraying with Bordeaux of the 6—4—40 strength was quite successful in preventing injury to the young vines.

In the general vineyard work, watch young vines and encourage their growth by good tillage. Protect them from caterpillars if these should put in an appearance.

In older vines, where growth is well forward, disbudding of growths coming from stems may be done, and at the same time many useless growths can be removed from positions where they are interfering with the fruiting wood. In many localities it may be too early to start these disbudding operations, but is well to have it done as early as possible.

THE MILK SUPPLY OF GREAT BRITAIN.

THE Milk Control Board of the British Ministry of Food recently issued a memorandum as the result of inquiries, the three main conclusions being as follows :—

- (*a*) The production and consumption of milk and dairy products in Great Britain could be considerably increased to the advantage of the farmer and of the public.
- (*b*) The quality of the present milk supply is rendered gravely defective—
    1. by the presence in the milking herd of cows suffering from tuberculosis;
    2. by faulty methods used in the production and handling of milk from the farm to the consumer (including delay in distribution).
- (*c*) The present system of milk distribution is very uneconomical, and could be so reorganised as to allow at once of a liberal price to the farmer and a fair price to the consumer in certain centres.

Be it added—Great Britain is not the only country of which these reflections are true.

BORDEAUX *v.* BURGUNDY.

POTATO-SPRAYING experiments on plots of considerable size, conducted at Wye Agricultural College, Kent (England), during 1918, once more indicated that under English conditions Bordeaux mixture is a more satisfactory fungicide than Burgundy. The variety used (Great Scot, seed one year from Scotland) showed severe scorching of the haulms when both 1 per cent. and 1·4 per cent. strengths of Burgundy were used, while Bordeaux mixture produced no scorching, and its use was attended by increases of up to 2 tons 9 cwt. per acre where it had been applied three times.

Contemporary with this comes a report of potato experiments in Ireland, in which Burgundy mixture was the only blight control used, so satisfied does the Irish Department appear to be with that fungicide for their conditions.

Poultry Notes.

OCTOBER.

JAMES HADLINGTON, Poultry Expert.

IN view of some friendly, but perhaps uninformed criticism concerning what was considered a lack of experiment work at Hawkesbury Agricultural College, it may be well to review what has been done and what is in progress at that institution.

Since my appointment six years ago, an entirely new and extensive poultry plant has been erected under my supervision, the intention being to create a demonstration farm at which sound methods of poultry culture could be inculcated. Five years ago a start was made at the hatching of chickens. Last year close upon 4,000 were reared; this year that number will be exceeded. This in itself might mean but little, if it was not the foundation of work now in progress and yet to be done. But it would appear that, unless a lot of inconclusive data is published from time to time, there are those in the poultry world who rush to the conclusion that nothing is being attempted.

Experimental Work at the College.

It might be pointed out that the first requisite for experiment work with poultry, or, for that matter, with any form of animal life, is "stable-bred" stock. Now, since but little or no dependable stock in this regard was available, this necessity had to be supplied by breeding up on definite lines. This has been and is still occupying us. Three and a half years ago, in addition to other work, the first batch of pullets was put in the single-testing pens with the object of carrying out an experiment to throw some light upon the mode of transmission of fecundity—one of the greatest of the problems that confront the poultry farmer, and one that has certainly not yet been solved.

It was early in 1917 that a group of hens, which had been tested as pullets (their tallies ranging from 231 to 253 eggs per bird), were mated to male birds whose dams had not been tested, but who were of a more stabilised strain so far as type and character were concerned. The next step was to test the pullets bred from this mating. On being single-pen tested alongside and under identical conditions with other pullets bred from untested hens, an interesting comparison was provided. There were fourteen pullets in each lot, and the only difference in the average put up by the two lots of pullets was six eggs per bird in favour of the pullets bred from the highly fecund hens mentioned above over the hens bred from untested stock. This, if taken alone, would tend to discount the generally accepted notion that high layers produce their like, but it should be understood that the result of one experiment is not sufficient to base any conclusion upon. In itself the result goes to show how misleading the result of a single experiment may be—

and yet three years had to be spent in preparation for the main experiment. However, the experiment work has only just been begun.

The next step was to mate the pullets bred from the high producers with cockerels also from highly fecund hens that had been tested. At the present time the pullets from that mating are under test, having been bred on both sides from single-pen tested hens. From this it will be seen that the real experiment has only now begun. It should be sufficient to show that experimentation is not, or should not be, the superficial thing that many have in mind when they advocate experiments. It also shows that the Department is carrying out important experiment work in an unostentatious manner, though it could not be otherwise, of course, unless the public were to be led astray by the publication of inconclusive results—a practice that is only too common.

A Concurrent Experiment.

In addition to the above, another experiment, suggested by the Agricultural Section of the Royal Society, has been laid down this year with the same object in view. This second test is based practically upon the researches of Dr. Raymond Pearl, and has in view the testing of that gentleman's assertion that the transmission of fecundity is through the male. The incidence of this further experiment consists of two pens :—

No. 1.—One Australian Game (black red) cockerel from an untested dam is mated to six Australian Game (black red) untested hens and six White Leghorn tested hens. The individual records of the White Leghorn hens for eleven months' testing were 233, 226, 219, 217, 195, 192. These hens were bred from the pen of hens already mentioned, the tallies of which ranged from 231 to 253.

No. 2.—One White Leghorn cockerel (bred from a hen that had laid 293 eggs in twelve months) is mated to six Australian Game untested hens and six White Leghorn tested hens. The individual records for these White Leghorn hens for eleven months' testing were 204, 204, 195, 191, 191, 190.

In explanation, it might be stated that the object in arranging the matings in this way was to give most weight to the cockerel whose dam laid 293 eggs. The object of introducing the Game into these experiments is, of course, to give greater weight to the same factor. Here again, it will be seen that this experiment was dependent upon work put in hand three years before.

Feeding Experiments.

Experimentation in feeding has not been overlooked; and some minor experiments, such as dry mash feeding, feeding fish meal, and feeding pickled bluestone wheat, have been carried sufficiently far to demonstrate what was necessary.

I think it will be agreed that the stabilisation of a ration for poultry is as much an experiment in its relation to present-day methods as any other experiment on feeding could possibly be, having in view the varied methods of feeding poultry that are in use. The position is that five years continuous feeding on a ration that has produced the results that have already been published is something from which the intelligent poultry-farmer might learn a great deal, if he would accept the method of feeding as something that has not yet been surpassed in the average results obtained. The results secured in the laying competition at Hawkesbury Agricultural College, where the birds are fed on the ration published by the Department, have not been excelled in average results by any competition in Australia, and the results produced in Australia have not been excelled in any part of the world, and this notwithstanding that a variety of rations has been fed in other competitions. Then again, the ration fed at Hawkesbury Agricultural College, and advocated by the Department, is made up of the cheapest and most economical foods available to poultry men. Not only in the egg-laying competitions, but in the feeding of the College stock the same ration is used, and no better development is seen anywhere in young growing stock, or in grown stock, than at this institution. This is acknowledged by hundreds of visiting poultry farmers.

Feeding Chickens.

In regard to feeding chickens, the ration published in last month's notes is of a most economical character. The mash upon which the chickens are fed, to the extent of about three-fourths to four-fifths of their entire ration up to six weeks old, is costing less than 7s. per cwt., while the chicken mixture that goes to make up the balance of the ration is costing 11s. 6d. per cwt. Contrast this with the expensive foods used by a large portion of poultry keepers, ranging in price, as they do, from 18s. to 28s. per cwt., with certainly, to say the least, no better development. If the Department of Agriculture was doing nothing else in the interests of the poultry industry, it would be doing solid work in such a demonstration as this. But among the difficulties encountered by the Department are the vagaries of poultry farmers who attempt to better their results by feeding otherwise than what has been demonstrated to be economical and practicable.

While on the subject of chicken feeding, I might refer to another bit of criticism, in which I am quoted as saying that "perhaps chicken mixtures might be bought ready mixed almost as cheaply as many farmers can mix them." This was written at a time when it was literally a fact, but it is regretted that, in view of the present prices for chicken mixtures, the recommendation cannot now be made.

The Competition.

Another forward step of the Department in regard to poultry was made when, in 1916, the whole of the egg-laying competition pens were brought under the single-pen system, involving the erection of 700 single pens. Whatever criticism might be levelled against competitions in general, there should be no question about the value of 700 single-pen tested hens being returned to their owners with proper identification numbers attached to each bird, together with their individual tallies.

THE PRODUCTION OF ONION SEED.

ONIONS are selected for seed production at the end of the summer; the ones chosen are the good keepers—which is ascertained by pressing the top and butt to see if sound—and those that are true to type.

They are planted about June or July, a cross being cut on the top of the onion about half the depth in order to allow the resultant growth from the centre plenty of room. The onions are planted in rows about 3 feet apart, about 18 inches separating each onion in the rows, half the onion being buried in the soil and the earth heaped over the other half.

Numerous shoots are sent up, and each bears a seed head, which, if in a sheltered place, is perfectly safe from shattering, but under exposed conditions needs some support. When the heads are formed and the thin sac enclosing the seed bursts, the heads are ready to harvest and should be hand-picked each day as they mature. The cleaning of the seed is usually performed by the agency of hand sieves and the wind, the seed being dropped from a height in order that the chaff may be blown free.

The same onions should be available for seed for three or four years, the tops being cut off and the rows cultivated to keep away the weeds. Seed more than one year old should not be sown until proved sound by a thorough test for germination. A rough and ready test is to immerse the seed in water. That which sinks is held to have good germinating power, the remainder being discarded. A more satisfactory test can be made by putting some seed between sheets of blotting paper kept moist in a fairly warm place.—J. E. SYME, Inspector of Agriculture.

WHEN TO HARVEST VETCHES.

As regards the utilisation of the vetches, one of the main difficulties is to have the crop consumed just when it will supply the maximum amount of nutriment in the most suitable form. It is best when utilised just at the flowering stage and when the pods are beginning to form, but in order that the produce from any single sowing may provide food for a period of three or four weeks, a start with the cutting (if for soiling) must be made before the crop is at its best; even then, by the time it is all consumed, some of it will have become over-mature and a little hard and fibrous.—W. G. R. PATERSON, Professor, West of Scotland Agricultural College.

THE ADVANCE OF SCIENTIFIC AGRICULTURE.

AGRICULTURE and horticulture are still in the main ruled by empiricism and tradition, and while it is true that many of the more recent advances in science go to confirm the wisdom of the ancients, no one can doubt that we are still far from possible ends in many directions. Scientific methods of plant-breeding alone are capable of indefinite expansion. Scientific methods of controlling plant diseases can be foreshadowed with considerable confidence. The crop-bearing capacity of the soil . . . may be increased by scientific means, and in the region of diseases of live-stock, the possibilities of progress have scarcely been explored.—*Nature.*

Orchard Notes.

OCTOBER.

W. J. ALLEN and W. LE G. BRERETON.

Cultivation.

IN last month's notes it was mentioned that the orchard soil should be put in a condition to retain moisture for the coming season's crop, and too much stress cannot be laid on the necessity of maintaining it in that condition during the summer months.

The current month's work in this direction depends largely on the ploughing scheme adopted in the winter. For instance, where the orchard has been ploughed early in the autumn, the second ploughing will generally have been completed towards the end of September, and if the soil has become set the cultivator will be sufficient to get it into condition. If, on the other hand, the orchard received its first ploughing for the year in midwinter or a month later the soil is likely to require the second ploughing this month. In apple and pear orchards it is preferable, if possible, to get the first applications of lead arsenate and fungicide (involving as they do, a certain amount of trampling of the surface) completed before the second ploughing.

Where heavy crops of weeds or of cover crops that have been ploughed under during the winter have not rotted sufficiently to permit the use of tine cultivators, disc cultivators will have to take their place. A too-continuous use of the disc cultivator should be avoided, however, as the implement is apt to reduce the surface to too fine a condition. Furrows should be provided after cultivation to carry off storm waters, otherwise there is a great risk of the soil being badly washed away. As it is impossible to foretell when storms will appear, it is wise to provide such furrows at the completion of each day's work. One of the most important features in laying out an orchard in steep country is to provide for frequent and easy outlets for such furrows without their being in any particular place too long.

With deciduous trees, cultivation by horse implements should be run as close to the trees as possible, and hand work thus reduced; but those parts that cannot be reached by the horse implements must be loosened and kept clear of weeds with either the pronged or flat hoe. This hand operation is most important with young trees, and in some cases it is wise to place a mulch of rotted farm manure, straw or bush rakings to assist in conserving moisture. Such mulch should not be placed in actual contact with the main stems of the trees, or collar rot may ensue. If weeds spring up through the mulch, they should be dealt with immediately, otherwise they will rob the trees of moisture and defeat the object of the mulch.

The Care of Young Trees.

During dry spells newly planted trees may require watering until their roots are well established. This can be done by opening a deep furrow round the tree with a hoe or shovel, pouring in a couple of buckets of water, and, when it has soaked away, covering in the furrow again with dry soil.

If it is necessary to support trees in windy positions by tying them to stakes, care should be taken that such stakes are short and do not cause harm by projecting up into the branches. Where young trees and buds and grafts are making vigorous growth, and are under conditions (such as irrigation) where there is very little chance of a check during the growing period, the young shoots can be pinched back when they have extended a few inches further than required. This reduces the liability of the young main shoots being blown out, and also causes them to form side shoots. A few weeks later, these side shoots can be thinned out, leaving those in the best positions, and thus two seasons' formation is secured in one. The time for this operation will vary according to variety, district, season and conditions under which they are growing, and will extend from the latter part of this month up to Christmas.

Where young trees are making poor growth, pinching back will only stunt their growth further and it should not be done; but from the time all young, partially formed trees make a start in the spring, they should be watched and their growth directed where necessary. Often a strong growth will start in a position where it is not required, at the expense of essential shoots. The unnecessary growth should at once be suppressed or taken right out, so that all the energy of the tree is thrown into the right channels. Sometimes some of the essential leading shoots will outstrip their neighbours, and to prevent the tree from becoming lop-sided the strong shoots should be checked to allow the weaker ones to catch up. Sometimes there is an over-abundance of leading shoots, in which case those in the better positions can be retained and the others thinned out, though it is wise always to leave more leaders than will be required at winter pruning, as there is always risk that some will be blown out or damaged during the season.

The newly planted trees will require disbudding, leaving four or five good shoots evenly spaced, around and along the main stem. These shoots will require watching, and if any is outstripping the others, it should be checked.

Spraying.

Directions for the first application of spray for black spot and codlin moth of apples and pears were given last month, in time for exceptionally early varieties in early districts, but the greater part of this work in the main apple and pear districts will take place during this month.

The second application of lime-sulphur or Bordeaux mixture for black spot can be applied (summer strength) in combination with the first lead arsenate spray. When these sprays are mixed they should be used at once, as, if left standing mixed any length of time before using, there is danger of them causing burning.

The later applications of lead arsenate—made at intervals after the first or calyx spray—are given to protect the growing fruit from the attacks of the codlin grub, but they must be only partially successful as ordinarily applied, for no matter how fine the spray, the minute drops collect and when dry leave the surface of the apple only partially and patchily covered. To overcome this difficulty experiments with spreaders have been in progress in the orchard at Bathurst Experiment Farm. Last season, Mr. Meier, Orchardist at that farm, found that contrary to the previous season's results, soap gave the most satisfactory results. He used the following :—

8 lb. soap.
4 lb. lead arsenate.
80 gallons water.

Mr. Meier also found that by adding ½ pint of a concentrated tobacco extract to the above, a good spray for woolly aphis as well as codlin moth was obtained.

The use of soap in this way will require further testing before it can be definitely recommended, and where growers intend trying it, they should only add the soap just before commencing to spray, as if the mixture is allowed to stand, arsenic may be set free and burning will result. A report of investigations in the Chemist's laboratory was published in the *Agricultural Gazette,* in July, 1917, when it was stated that experiments indicate that " soap should not be mixed with lead arsenate."

Other Fungicides and Insecticides.

As the buds of grape vines begin to burst they should receive their first application of Bordeaux mixture. If the weather is showery, the young growth should be dusted with flowers of sulphur when they are a few inches long.

Peach, nectarine and Japanese plum trees should be watched and dealt with as described in last month's note if black or green aphis should show.

During the summer months woolly aphis is best dealt with by applications of tobacco wash or one of the commercial nicotine extracts.

Correction.

Attention is drawn to the fact that in these notes in the August issue of the *Agricultural Gazette* it was stated, under the heading " Late Spraying of Citrus Trees," that " though we know of no case where the use of lime-sulphur during the winter on citrus trees has taken fruit off or damaged the trees, still it is advisable to avoid its use during the coldest months." The words " lime-sulphur " should have read " resin-wash."

Agricultural Bureau of New South Wales.

The Objects of the Bureau.

THE Government will subsidise branches of the Bureau at the rate of 10s. in the £1 on membership fees; annual subscriptions should not be more than 5s. nor less than 2s. Where a branch does not exist within a reasonable distance, farmers or others should communicate with the Agricultural Department with a view to a new branch being formed. Mr. L. S. Harrison of the Field Branch is taking up the Bureau work, and a progressive period is anticipated.

Suggested Subjects for Bureau Meetings.

What grade are you getting for your cream, and how do you handle it to get that grade? What method of cooling do you adopt? Discuss the frequency of delivery under your conditions and the effect upon quality.

Rabbits being much reduced in numbers, do you think any methods could be adopted that would keep them continuously in check? Would it pay just now to give special attention to the ploughing in of the many unoccupied burrows? Would it be possible by co-operative action in localities to deal more effectively with the pest, such as by simultaneous poisoning, or digging out and hunting?

What methods do you employ to expedite spraying operations? The period for the application of sprays is often very limited, and everything that eliminates lost time is of consequence. In this connection (1) *How do you mix the sprays?* (2) *Do you cart the spraying mixture to the spray cart in order that the nozzles may be kept going full time?* (3) *On larger areas, do you have several distributing stations to reduce the carting?*

Have you ever practised thinning out the setting of fruit, and with what results? What is the most effective stage for the work? Some varieties seem to respond better to this treatment than others; have you had any similar experiences?

Has the hatching of chickens in your district been all that might reasonably be expected this season? If not, to what do you attribute the failure or deficiency? What methods are you adopting to ensure the best development among the young stock?

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse the opinions expressed.

Cordeaux-Goondarin.

The annual meeting of the members of this branch was held on 14th August, when the members attended in full force. After the routine business of the meeting was ended, a discussion on the destruction of the flying fox took place. After considering the various methods advocated, the members came to the decision that the Government should be asked to increase the subsidy to 3d. per scalp, and that all associated branches be asked to deal with the pest as soon as it appears in their district.

This branch has commenced buying its own requirements in spraying materials and manures on the co-operative basis, which members feel will serve to unite them more closely when its advantages are seen.

The following officers were elected for the ensuing twelve months:—Chairman, Mr. H. E. Cowain; Vice-Chairmen, Messrs. W. Woodyatt and J. Murphy; Treasurer, Mr. R. J. Fishlock; Hon. Secretary, Mr. F. A. March; Librarian, Mr. Roy Fishlock.

Cunningham.

The annual meeting of the above branch was held on 15th August, when there was an attendance of fifteen members—a representative gathering.

The balance sheet was read and adopted, there being a cash balance of £2 7s.

The following elections took place:—Chairman, Mr. H. M. Hull; Vice-Chairmen, Messrs. A. Barker, Thos. Hobson, and Wm. Rolfe; Hon. Secretary and Treasurer, Mr. B. J. Stocks. One new member was enrolled.

A pruning demonstration was given on the 8th September at Mr. A. E. Ough's orchard by Mr. Hogg, of Wagga Experiment Farm. Valuable information was gained and the demonstration was greatly appreciated.

Dural.

A meeting of the above branch was held on 15th August, when some of the questions suggested in the July issue of the *Agricultural Gazette* were discussed:—

On the subject of manuring the orchard, it was stated that the general practice in the locality is to manure either once or twice a year with the best blood and bone obtainable. Of late, however, there had been complaints about the efficacy of mixed manures, and many growers were said to be buying the various manures and mixing for themselves. Several members testified to having excellent results with sulphate of ammonia, which, even though high in price, was regarded as cheapest when the results were considered. The practice was to sow on the surface, and only during moist weather or after rain, and then lightly harrow in. About 2 lb. per full bearing tree was considered a fair dressing. It was considered advisable, from the point of view of economy in time, to sow a complete fertiliser rather than any particular fertiliser alone. In the absence of potash one grower said he was getting good results with citrus from the following mixture:—Two parts bonedust, one part blood, one part superphosphate; 8 lb. per tree. Another formula given by a successful grower was made as follows:—Three bags superphosphate, three bags bonedust, one bag sulphate of ammonia. It was agreed that sulphate of potash was a very necessary fertiliser in the orchard, and that the fruit-growing industry had been seriously handicapped during the war by its absence.

Eulomogo.

A meeting of the above branch was held on 11th August, when there was an attendance of thirteen members. During the evening a discussion took place respecting a paper which was read at the last meeting on drought-resistant grasses and plants.

Lidcombe.

A meeting of the above branch was held on 25th August, when there was an attendance of twenty-nine members.

The business of the evening consisted of discussions on the cultivation of the tomato and the potato, and on draining. In connection with the tomato, most of the members favoured Chalk's Early Jewel for the early crop and Matchless as a second crop. With regard to the potato cultivation, several members were not in favour of hilling in the Lidcombe district. With reference to draining, the 3-inch agricultural drain pipe was considered by all present to be best, and its lasting qualities were regarded as undeniable.

Lower Portland.

The annual meeting of the members of the above branch was held on 4th August last, when the following officers were elected for the ensuing twelve months:—Chairman, Mr. B. King; Vice-Chairman, Mr. G. Gulliver; Treasurer, Mr. R. J. Wetherell; Assistant Secretary, Mr. H. W. Wetherell.

At a further meeting held on 1st September, Mr. H. Hayward was elected Hon. Secretary.

The Secretary's and Treasurer's reports read at the annual meeting showed that the branch was working on a sound footing.

March.

The monthly meeting of the above branch was held on 25th August, there being an attendance of ten members. A returned soldier, Mr. Chas. Griffith, was admitted a life member, and Mr. Arch. McKay was also enrolled.

During the evening the rules (by-laws) for the government of the branch were formulated, and general business was dealt with.

At the next meeting the subject for discussion will be the value of humus in the soil.

Middle Dural.

A meeting of this branch was held on 25th August, when there was an attendance of eight members. The business took the form of a discussion on the advisability of having a bill passed to control the standardisation and packing of fruit.

It was unanimously agreed that, as it was most important that growers should pack and grade fruit to get the best returns, and the grower who neglected to carry out this part of the business was being gradually pushed out of the competition, there was no necessity for a bill of the kind. It was in the grower's own interests to get his fruit up in the best possible manner.

Moss Vale.

On 8th August Mr. E. Breakwell, Agrostologist, delivered a lecture before a very good gathering of members of this branch and of settlers generally, his subject being "Grasses, and their importance to the Moss Vale district."

Mr. Breakwell pointed out that it was the heritage of her wonderful native grasses and fodder plants which had stood to Australia in the past, and which had given her a leading place in the woollen markets of the world. Yet it was a matter for concern whether that superiority could be maintained if pastures and grasses generally were neglected in the same manner as they had been. Droughts certainly were a setback, but should only be a temporary setback, and a properly managed native pasture should fairly quickly recover from their effects. Some of the main causes contributing to the lessened carrying capacity of the local pasture land were:—(1) The lack of proper attention to the correct and judicious management of pastures; (2) the disinclination in many cases to improve the quality of the pastures, that is, to increase the quantity of good grasses and to suppress the bad ones; (3) the failure to conserve fodder when conditions were good for the times when conditions were bad; and (4) the depredations of rabbits.

It was a remarkable fact that whereas most farmers had a full and wide knowledge of the important agricultural crops, a blissful ignorance was generally displayed as far as grasses were concerned. To most farmers anything green was grass, whether it be such foreign useless grasses as Yorkshire fog, Brome grass, stink grass, or whether it be the nutritious *Danthonia* or Love grasses. Certainly, the study of grasses was a most comprehensive one, but the practical and field side could be soon learned by any farmer, particularly if he solicited the help of the Agricultural Department, which was always ready to identify the grasses and give the benefit of its experience with them. If the seeding habits of the good grasses were studied, the stock could be removed from such pastures during a period long enough for the grasses to mature seed, and the pastures could be heavily stocked once the seed was ripe. The seed was thus trampled into the ground and the stock derived a benefit from the mature grass.

The climatic conditions of Moss Vale were such that many introduced grasses and fodder plants, which were little known at present, should do well. With four to five months' good summer growing weather, free from frosts, the newer grasses, Sudan and Elephant, and also Rhodes, should be productive of good results. The lecturer said he personally favoured Rhodes to paspalum, although the latter might carry more feed. Rhodes was more nutritious, far more drought resistant, and never matted the ground like paspalum.

There were some winter grasses like *Phalaris bulbosa*, Kentucky blue, tall oat grass (*Avena elatior*), and particularly the native *Danthonia* grasses, which should certainly, under proper management, provide good pastures. Cocksfoot and rye were much better than either grass alone. Cocksfoot lasted longer than rye, and the latter prevented the cocksfoot from becoming too tussocky. Farmers should also beware of the useless Yorkshire fog grass, which, on first sight, was something like cocksfoot. This grass was introduced by seed contained in cocksfoot grass seed from New Zealand, and was thus common in most cocksfoot pastures. Kentucky blue grass was not only a good lawn grass but an excellent pasture grass. Many failures had been recorded from it, but this was because weeds often smothered it while it was slowly becoming established. It could well be grown with rye grass as a cover crop to prevent this. The advantages attached to Chilian clover, Crimson clover (as a rotation crop), Bokhara clover as a pasture plant and as a preparatory crop for lucerne, and the spineless burr trefoils were also dealt with.

The speaker pointed out that the Chief Inspector of the Department had emphasised the necessity of conserving fodder for dry periods, either by making ensilage, bush hay or cereal hay. Bush hay had already been made in Moss Vale with very satisfactory results, and now the cheapest methods of conserving fodder had been studied by the Department, the latter would willingly give the result of their knowledge and experience in this matter.

Orchard Hills.

The annual meeting of the above branch was held on 11th August. The Treasurer read the balance sheet, which showed a credit balance of £4 12s. 1d. The following officers were elected for the ensuing year:—Chairman, Mr. E. Basedow; Vice-Chairmen, Messrs. R. Rankin and J. Dickson; Hon. Secretary, Mr. K. Basedow.

Owing to the influenza epidemic, only four meetings had been held during the past year. It was anticipated that the new year would be more prosperous, several new members having enrolled.

Springside.

The following paper on a market garden was read by Mr. L. Selwood, at the meeting of the above branch, held on 12th August:—

VEGETABLE GROWING.

The necessary essentials for successful vegetable growing are a deep rich soil and a permanent supply of water. The latter is even of greater importance than the former. One can enrich the soil, but may find it difficult to obtain water in sufficient quantities during the drier periods of the year to keep vegetables thriving. A market garden may be said to be merely a kitchen garden on a larger scale, with more space between the plants to permit of the use of light horse-drawn implements in place of the fork or spade. My idea is to show what returns were obtained this season from a couple of small plots of what was looked upon as practically waste land, and the methods employed to bring these plots to the state necessary for production.

The piece chosen was the most forbidding spot on the farm; it was formerly a ti-tree swamp, and was covered with coarse grass and reeds as high as one's knees. It looked hopeless, except as a breeding ground for frogs and snakes, but the water was chiefly issuing from springs on the higher levels, and as a quantity of soil had from time to time been carried into the swamp by flood waters, both the essentials for a vegetable garden—a deep rich soil and water in abundance—were present. The first operation was thoroughly to drain it. To do this an open drain was cut through the centre or lowest part, with smaller drains branching from the open drain to cut the several small springs, which were then closed in by driving small piles down each side and covering in with stout slabs, finally topping up with soil. In a little while the drainage system was working splendidly, and the soil was drying rapidly. While waiting for this, the herbage was cut down, so as to make the digging possible. This latter process proved no easy matter, but it was completed at last. Vegetable-growing was a long way off yet, however, for it was surprising how much time it took those roots to decay. I next skimmed over a bit of the surface, and repeated this process at different periods, going a little deeper each time, until the soil was worked to the necessary fineness and depth. A small plot of cabbage was sown, also one of cucumbers and tomatoes, and the largest area was devoted to peas. The only fertiliser used was wood-ash, and although the season was a very trying one for anything in the vegetable line, beautiful specimens of all species planted—especially the peas—were obtained. From a plot measuring 1 chain long by 8 yards in width I got a return of £5 from one picking, and from the plot planted with potatoes, measuring 2 chains by 1 chain, I dug 1½ tons, which gave me a return of £18, or a total of £23 in addition to the vegetables used in the home. The return was highly satisfactory, considering that the plot from which it was made was but a short time before regarded as waste land.

Departmental Note.—The Chief Inspector remarks that this useful paper indicates how profitable crops of vegetables for home use and marketing may be obtained even under adverse conditions. By a combination of brains and determination, with a willingness to work, much might be done in this direction. Fresh wholesome vegetables can be made available for the grower's use, with a consequent improvement in health, while the cost of living is materially reduced. At Condobolin Experiment Farm, the Manager has been able to secure excellent crops of fruit and vegetables by the simple expedient of placing a controlling bank around the homestead garden, and by means of drains the water is conducted into the area, and a liberal irrigation provided by each light shower of rain. The subsoil is well saturated, and by surface cultivation sufficient moisture for the needs of the plants and trees is provided.

Stockinbingal.

At a meeting on 14th June a paper was read by Mr. A. Gilmour, his subject being lamb-raising.

Mr. Gilmour opined that for the purposes of raising lambs in conjunction with growing wheat on small areas the most suitable ewe was the first cross Lincoln-Merino. These ewes made splendid mothers and cut a good fleece of wool; they should be mated with Shropshire rams about the middle of November at the rate of three rams to one hundred ewes. A certain amount of attention should be given to the ewes during lambing to prevent losses, and farmers would find they would be obliged to resort to better methods of feeding than were generally practised. Rape and barley could be profitably grown for well-worked fallowed land, sown about the end of February, to supply winter feeds, as it would be necessary to have the lambs well-grown and in good marketable condition at 5 or 6 months old.

Discussion.—A lengthy discussion followed, several of those present being in favour of a cross between the plain-bodied Merino ewe and Dorset Horn or Border Leicester ram, such a cross producing an earlier and better percentage of lambs than the Lincoln and other coarse-woolled rams.

Departmental Note.—The Sheep and Wool Expert remarks that the crossbred ewe is always preferable to the Merino ewe for lamb-raising. The Department has obtained excellent results from Dorset Horn rams as sires of early lambs, but only from crossbred ewes, not from Merino ewes. The Shropshire on the crossbred ewe furnishes a very shapely lamb; but it has been found that the lambs by Dorset Horn rams are earlier, and, if anything, more hardy. Their wool, too, is a better colour, exhibiting none of the black points which are characteristic features of the Down breed. So impressed is the Department with the suitability of the Dorset Horns for lamb-raising that it has established purebred flocks of imported stock on the Wagga and Yanco farms.

In order that farmers may have the opportunity of giving the breed a trial, the Department is prepared to supply rams at a moderate price.

Stratford.

The annual meeting of the above branch was held on 27th August.

The balance sheet showed a credit balance of £1 10s. 1d. During the year books to the value of £4 had been purchased and placed in a library for the benefit of members. As the branch was found to be in a financial position, it was decided to reduce the membership fee to 2s. 6d. per annum. Twelve members were present at the meeting, and six new members were enrolled. Others also signified their intention of joining. Books loaned to the branch from the Public Lending Library were much appreciated and had proved of great interest to members.

The election of officers resulted as follows:—Chairman, Mr. J. P. Shedden; Vice-Chairman, Mr. T. Germon; Treasurer, Mr. H. T. Perrin; Hon. Secretary, Mr. P. H. Deards.

Tallawang.

The monthly meeting of the above branch was held on 13th August, there being present twenty-five members and visitors.

After general business, Mr. A. H. E. McDonald, Chief Inspector of Agriculture, delivered a lecture on silos and the conservation of fodder, which was greatly appreciated, and deeply impressed every hearer with that inexpensive and effective way of anticipating and providing against periods of scarcity.

Toronto.

A meeting of the above branch was held on 5th August, there being an attendance of nine members. It was suggested that a request be forwarded to other branches from the Toronto branch, in conjunction with the Cordeaux-Goondarin branch, that the Department formulate a campaign for the destruction of flying foxes throughout the State. It was further suggested that a greenhouse be constructed for the Toronto school.

During the evening Mr. Cockburn gave a very interesting demonstration on pruning, and a hearty vote of thanks was accorded him.

Wellington.

At a meeting of this branch on 19th August, Mr. C. J. Kimbell read a paper on the culture of the strawberry, from which the following condensation is taken:—

Propagation can be effected from seeds, also by division and runners. Seeds are only sown for raising new varieties. Most plants are grown from runners, the best plants being those formed first on the runners.

Unfruitful plants produce the most runners, and such should never be selected for propagation; never use old plants if young plants are procurable.

Every care should be taken in transplanting; the crown should be on a level with the ground, and the roots spread fan-shaped when setting, and the soil made firm round the plants. Runners are best layered in 3-inch pots, half plunged between every other row; this leaves space for gathering the fruit and watering the runners. Fill the pots to within half inch of the rim with soil pressed firmly. Make an indent in the centre and place the plantlet of the runner therein.

The strawberry may be grown in any part of the Wellington district. A strong loam is generally the most suitable, and light and shallow brashy soils the worst. I have seen good crops grown on sandy loam, and also on a rich clay loam.

The strawberry grows wild in England, and I have picked wild strawberries of good flavour. In the wild state it is never found where water lodges, but always on raised ground through which it passes freely, the soil being enriched by fallen leaves and decaying vegetation. In cultivation we have to deal with different plants, but there is always similarity, and one cannot do better than follow nature, and plant on raised ground.

In the growing of strawberries there are several plans for planting. The hill system is the best for good fruit; the plants should be set 15 inches apart in rows, and the rows 30 inches apart. No runners should be allowed to be grown in the hill system.

The matted-rows system is generally adopted by large growers, as less labour is required for this plan; the rows are 4 feet apart, and the plants 30 inches in the row. After the first crop runners should be allowed to form at will, except that a small path should be cleared between the rows. April is the best month for planting in this district. It is impossible to grow strawberries in the Wellington district without plenty of water. The best way to keep down evaporation in the strawberry bed is by mulching with stable manure.

A variety that is doing well in this district is Phenomenal. I saw it grown at Mr. F. Bathos' in the matted-row system, and judging by the bed he has and the return he made, it works out over £200 per acre. I also saw the new variety growing at Mr. Harvey's, known as the Ettersburg. Ettersburg is a recent importation from the United States, and first originated in California in the garden of Albert Etter. The Ettersburg strawberry has become the most popular variety in New Zealand. Cresswell's Seedling is another variety that does well in this district.

To practice artificial impregnation successfully the stamens of the seed-bearing flowers must be removed before the pollen is ripe, enclosing the flowers in gauze bags to prevent natural fertilisation by bees, then applying pollen from the desired variety to the stigmas with a camel's hair brush or rabbit's tail. The blossoms of the strawberry are two—perfect and imperfect. The perfect flowers contain male and female organs, and the imperfect flowers only female organs. More than one variety should be planted to furnish imperfect flowers with pollen.

Fungus diseases attack strawberries any time during the growing season. For mildew, use sulphur; for spot, use Bordeaux mixture; for green or black flies, spray with tobacco water and soft soap.

DISCUSSION.—In the discussion which followed the paper it was agreed that strawberry plants produce better fruits on light loams than on heavy soil, and the crop ripens earlier. In the Wellington district strawberries can be gathered for four months in the year with proper care and attention. The best fruit is gathered from plants in their second and third years. After the third year, when replacing the plants they should be put on new soil. One local grower had great success with his strawberries by growing them in double rows on raised beds with a path in between for irrigating and walking on.

Strawberries require plenty of moisture. The leaves should never be allowed to flag.

Windsor.

A meeting of this branch was held on 15th August, when Mr. F. Whitehouse, B.V.Sc., Veterinary Officer of the Stock branch, delivered an address on ailments commonly met with in horses and cattle. A summary of Mr. Whitehouse's remarks follows.

COMMON AILMENTS IN FARM STOCK.

Diarrhœa in horses, he said, was usually due to some irritant in the intestines. A good practice was first to administer a pint of raw linseed oil, and to attend carefully to the diet. Take the chill off the water and then give flour gruel or linseed tea; these act as soothing lubricants. Feed little and often on oats and bran, but not on maize. Drench twice daily with a mixture made of 1 oz. baking soda, 1 oz. laudanum, and one pint warm flour gruel. If the diarrhœa is a symptom of some other trouble, treat that trouble and probably the diarrhœa will cease. Cattle should be treated similarly, administering 1 lb. Epsom salts and drenching with a mixture consisting of 2 drachms powdered opium, 2 oz. prepared chalk, 2 drachms powdered catechu, and 1 pint warm flour gruel; this mixture must be well shaken before it is administered.

Blood scours in calves is rampant in a certain class of dairy; it usually occurs where the conditions are insanitary and the methods of feeding careless. If these conditions are removed, blood scours will occur no longer, or at any rate, to such a slight extent that the disease can be easily kept in check and the mortality will be negligible. When an outbreak has occurred it is better to select a new site and discard the contaminated one altogether. If this is impossible, all dirt and refuse in and around the pens, together with the pens themselves, should be burnt, and the yards should be top-dressed with lime and then dug up. Failing this treatment, all the pens, fences, utensils, &c., with which affected calves have been in contact should be thoroughly cleansed and disinfected, and the whole of the buildings, floors and fences treated periodically with freshly-made limewash. The following is a cheap and serviceable wash for the purpose :—½ lb. fresh unslaked lime, 1 cup crude carbolic acid, 1 gallon of water.

All vessels coming in contact with the food of calves should be cleansed and scalded after use.

As a first measure in the handling of calves, the navel of all newly-born calves should be dressed with carbolic oil or tincture of iodine. As soon as scouring is observed, isolate the affected calves and reduce the milk allowance, making up the deficit in the daily ration with warm flour gruel. Administer 2 oz. castor oil, and into each bucket of milk put a teaspoonful of the following mixture :—1 oz. formalin, 1½ pints water. Healthy calves should have free access to fresh clean water, and after they are a week old green fodder in small quantities may be fed to them. Limewater is advisable in proportion of three wine-glassfulls to each gallon of milk, which should have been pasteurised, and should then be fed at blood heat.

In the calf paddock should be placed the following lick :—1 part powdered sulphate of iron, 5 parts sterilised bonemeal (phosphate of calcium), and 30 parts Liverpool salt.

The treatment for diarrhœa in pigs, other than that due to specific diseases such as swine fever, should consist in the administration of 2 to 4 oz. of castor oil, according to the size of the animal. Give in the food or as a drench with flour gruel a teaspoonful of the following powder three times a day :—1 part powdered opium, 10 parts chalk, and 5 parts powdered catechu.

There are two types of mammitis in milk cows, one non-contagious and the other contagious. The first is due to over-stocking, blows, tight-fitting milking-machine cups, horning, milking with dirty hands, &c. In most cases it can be prevented by carefulness in hygiene. Massaging after stripping with a soap liniment, castor oil, &c., usually effects a cure. Contagious mammitis is due to a specific micro-organism, and once in a herd it is difficult to eradicate; the disease may lie dormant for months. The following is a brief outline of the symptoms :—The quarters affected, and maybe the whole udder, are hot, tense, not much swollen, but hard and painful. Issuing from the teat canals are masses of greyish-yellow clots of milk, accompanied at first by small quantities of dirty straw-coloured fluid. Later this fluid becomes brownish in colour and contains clots of pus, and occasionally hard, pea-like lumps can be felt on palpation. There is not much constitutional disturbance. Treatment consists in regulating the bowels, and in a vigorous course of massage. Injections into the teat canals are attended with much risk, and are not thought to be advisable. Strip the quarters several times a day and after so doing massage well with the following mixture :—1 part tincture of iodine, 2 parts tincture of arnica, 3 parts soap liniment. Should the milk become apparently normal, dry off the cow, and as soon as possible fatten her for the butcher, as such a cow is only too often a carrier of disease and may infect a whole herd. As a preventive measure against the contagious form of mammitis, inoculation with a vaccine prepared from the specific micro-organisms is said to have been attended with beneficial results. The operation should be carried out by a qualified veterinarian. As soon as a cow is observed to be affected, isolate her and the calf, milk her last and boil the milk, which may then be fed to the pigs. Before attending to her, the milker should carefully disinfect his hands in a solution of lysol made of, say, 2 oz. of lysol to 1 gallon water, and this operation should be repeated when the milking and attention are over. When the pastures are heavily contaminated they should be fired where practicable and cultivated before cows are allowed to graze over them. All newly purchased cows should be quarantined until it is certain they are free from the disease. It is a very poor investment to buy a mammitis cow, no matter how good may be her yield or pedigree, for she is a potent source of danger to the whole herd.

Woonona.

The monthly meeting of the above branch was held on 12th August, there being a very good attendance of members.

During the evening Mr. Abel Jones gave an interesting and instructive address on pruning and the cultivation of flowers, together with a practical demonstration on the pruning of the apricot. Mr. Jones stated he could make a good living from 100 apricot trees.

The demonstration and address were highly appreciated by those present.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1919.

Society.	Secretary.	Date.
Hay P. and A. Association	C. L. Lincolne	Oct. 15, 16
Orange A. and P. Association	W. J. I. Nancarrow	,, 15, 16
Millthorpe A. and P. Association	C. J. E. Hawken	,, 22
Bathurst A., H., and P. Association (Spring Carnival)	S. V. Turrell	,, 25
Tweed River A. Society (Murwillumbah)	T. M. Kennedy	Nov. 12, 13

1920.

Kiama A. Society	G. A. Somerville	Jan. 24, 26
Nimbin A. and I. Society	B. R. Southwell	,, 27, 28
Berry A. Association	W. Pryor	Feb. 4, 5
Ulladulla A. and H. Association (Milton)	R. F. Cork	,, 18, 19
Dapto A. and H. Society	F. James	,, 20, 21
Inverell P. and A. Association	J. T. Dale	,, 24, 25, 26
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 24, 25, 26
Newcastle A., H., and I. Association	E. J. Dann	,, 25, 26, 27, and 28.
Yanco Irrigation Area A. Society	R. Tribe	Mar. 2, 3
Tenterfield P., A., and M. Society	E. W. Whereat	,, 2, 3, 4
Berrima District A., H., and I. Society	C. E. Wynne	,, 4, 5, 6
Wollongong A., H., and I. Association	W. J. Cochrane	,, 4, 5, 6
Mudgee A., P., H., and I. Association	E. J. Hannan	,, 9, 10, 11
Hunter River A. and H. Association (West Maitland)	E. H. Fountain	,, 10, 11, 12, and 13.
Armidale and N.E. P., A., and H. Association	A. McArthur	,, 16, 17, 18, and 19.
Cobargo A., P., and H. Society	T. Kennelly	,, 17, 18
Macleay A., H., and I. Association	E. Weeks	,, 17, 18, 19
Camden A., H., and I. Society	A. E. Baldock	,, 18, 19, 20
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 24, 25
Walcha P. and A. Association	S. Hargrave	,, 24, 25
Royal Agricultural Society of N.S.W.	H. M. Somer	March 29 to April 7.

The production and distribution of pure milk is an industry requiring a highly intelligent and skilled set of workers, and most careful and thorough management.—Alexander Lauder, in the *Scottish Journal of Agriculture.*

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Agricultural Gazette of New South Wales.

Silage under North Coast Conditions.

G. C. SPARKS, Acting Inspector of Agriculture.

OF the three distinct methods of conserving green fodder in the form of silage, that of stacking in the open is generally regarded as the most wasteful and the least to be recommended. There are certain modifying influences existing in districts such as the North Coast, however, that render the use of any other system almost impracticable. The making of ensilage is still regarded in many localities in the light of an experiment, and farmers in such districts are naturally disinclined to invest, without some experience, the amount of money involved by the high cost of materials and equipment in the making of a tub silo. Moreover, while the pit silo is an ideal type for the drier areas of the State, it is never likely to become popular on the North Coast, mainly because of the heavy rainfall experienced there, but partly owing to the fact that excavating machinery is only in the most rare instances included in the equipment of the farm.

None of these objections are, however, applicable to the stack silo. As appreciation of the advantages of conserving green fodder becomes more general, it may be anticipated that silage will come into very general use; meanwhile, any cheap and reliable method that will appeal to farmers generally, gaining for silage the esteem that it deserves and paving the way to the installation of the fully equipped tub silo, is to be welcomed.

A factor that has exerted a retarding influence upon the development of stack silage on the North Coast is the difficulty frequently experienced in securing the services of competent stack-builders. As little or no hay is produced in this district, opportunities for practising stacking are correspondingly few. Farmers are aware that bad stacking means increased waste, and realise that the collapse of the stack after completion would mean silage wholly spoilt—considerations which naturally make them somewhat cautious. In order to overcome these objections and to assist in bringing ensilage into more general use, a system of parallel stacking, as distinct from the square system of crossed bundles, has been evolved by Mr. H. C. Quodling, Director of Agriculture in Queensland. This new method has achieved much popularity in the northern State, and has also been practised successfully on the North Coast of New South Wales.

The advantages of the new system are, briefly, as follows:—

1. Practically all risk of collapse consequent upon bad stacking is eliminated, no skilled labour being required and the construction of the stack being such as to prevent collapse or canting.

2. Weather waste is minimised. Maize and sorghum are the crops almost invariably used for silage on the North Coast, and, as under the new system the bundles or sheaves are laid in the one direction, a much better compaction is obtained.
3. Good samples of silage can be made from amounts of material much too small for utilisation by the old method. A stack on the farm of Mr. Wm. Barnes, South Woodburn, Richmond River, contained only 25 tons of silage and turned out most successfully.
4. Some advantage is derived from the fact that when feeding the silage there are no great inequalities in length of stalk.

Building the Frame.

The new method is designed chiefly for handling maize or crops of similar habit of growth, such as sorghum and millet. It usually consists of an oblong stack, supported along both sides in order that the bundles may be laid in the one direction, the need for cross layers being thus entirely avoided.

The dimensions of the proposed stack must first be estimated, after which a row of bush poles is erected along each side of the selected site, as shown in the illustration. Great weight of timber or strength of framework is not absolutely essential, as the pressure is mainly downwards; and as the stack settles it contracts from the framework, which, if necessary, can ultimately be removed. The length of the poles is, of course, fixed by the height to which it is proposed to stack, but their diameter should be about 3 to 4 inches at their small end. The large ends should be inserted 30 to 36 inches into the ground, and the tops braced by a light pole, to which the uprights are wire twitched. The exact distance between the posts is determined by the length of the material to be stacked, well grown maize or sorghum usually being safe with a space of 36 inches between uprights, and 24 inches being recommended if a shorter growth has to be treated. The framework should be braced across the ends and the middle at the top, and, if possible, the poles carrying the centre brace should be sufficiently high to allow ample head room for the stacker to work as the stack nears completion. A pair of light poles should be erected at each end of the framework, and a light cross-piece provided to carry the heads of the end rows of bundles during stacking (as explained later).

The site selected for the stack should be a dry one, and it should be so located as to be convenient to the crop that is to be ensiled, and also to the point at which the material is to be fed to the stock.

It is always advisable to ensile as large a quantity of material as possible in one stack, as the larger the stack the smaller will be the percentage of waste. For general purposes a framework of about 25 feet long x 15 feet wide x 20 feet high is to be recommended. This space should hold enough green fodder to produce approximately 80 tons of silage, and at a safe estimate it should be filled by the product of from 5 to 6 acres of maize. If, however, larger supplies are available, better results are likely to follow with a stack containing 100 tons or upwards.

Crops Most Suitable.

In making recommendations as to crops suitable for silage purposes, two important points demand consideration. The almost complete absence of harvesting machinery on the North Coast greatly restricts the number of crops that can be ensiled economically, compelling small areas of bulky crops, while the humid summer and autumn, with the resultant plentiful supply of fodder, and the comparatively dry winter and spring, with their corresponding period of shortage, also comprise qualifying factors.

While most fodder crops included in the economy of the North Coast farm are suitable for silage in a greater or less degree, there are many reasons why maize should invariably be selected for the silage crops. Maize produces the greatest bulk of fodder, is easy of production and handling, and its silage is of the most nutritious and palatable nature. Further, as there is usually no shortage of fodder on the farm during the growing season of maize, the crop can be well spared for purpose of silage, and when the maize crop has been cut for silage, ample time remains to fit the soil for a winter fodder crop, especially if the maize has been sown in drills and cultivated.

Sorghums and millets are also eminently suited for silage purposes, but although producing a finer stalk growth than maize, and thus comparatively free from the possible coarseness of the latter, they cannot usually compare with it in point of yield, except in the case of sorghum upon inferior soils. The high sugar content of sorghum, however, causes a corresponding development of acidity when subjected to the fermentative changes of the silo, resulting in the production of sour or acid silage, which is regarded (particularly in northern areas) as being slightly superior to sweet silage for milk production. There is an element of risk with sorghum on account of its poisonous tendencies, and if it should be necessary to ensile an immature crop or one stunted by drought conditions, particularly in cloudy weather, it is advisable to cut it twenty-four hours before stacking.

Paspalum, cowpeas, Sudan grass, the various winter green fodders, &c., may all be included in the list of silage crops, but for reasons specified above they are unlikely to ever gain the popularity of maize for this purpose. While discussing winter green fodders for silage, however, special mention should be made of the combination crops, that is, mixtures of wheat or oats with field peas or vetches. Yields of 15 tons of green fodder per acre are not uncommon with these crops, and, although when at their maximum there is commonly a pressing need for green fodder, at the same time any surplus can well be conserved as silage where the requisite machinery is available. The mixture of cereal and legume is usually so complete in these combination crops as to entirely avoid all risk of uneven settling—a risk that has to be guarded against when mixing one or more crops in the stack.

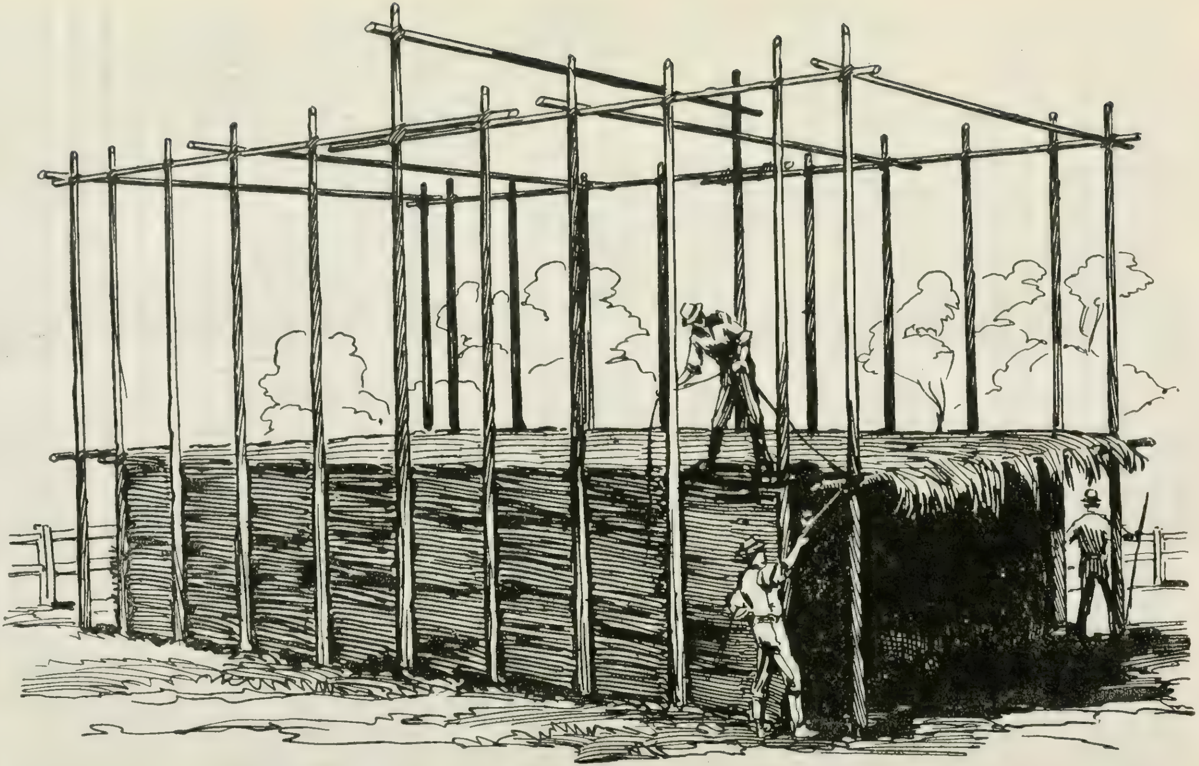


Fig. 1.—A Silage Stack suitable for North Coast Conditions.

The framework supports the material until it settles into a compact mass. The material overhanging the crosspiece at the right hand side is being cut off to produce an even face as described in the matter.

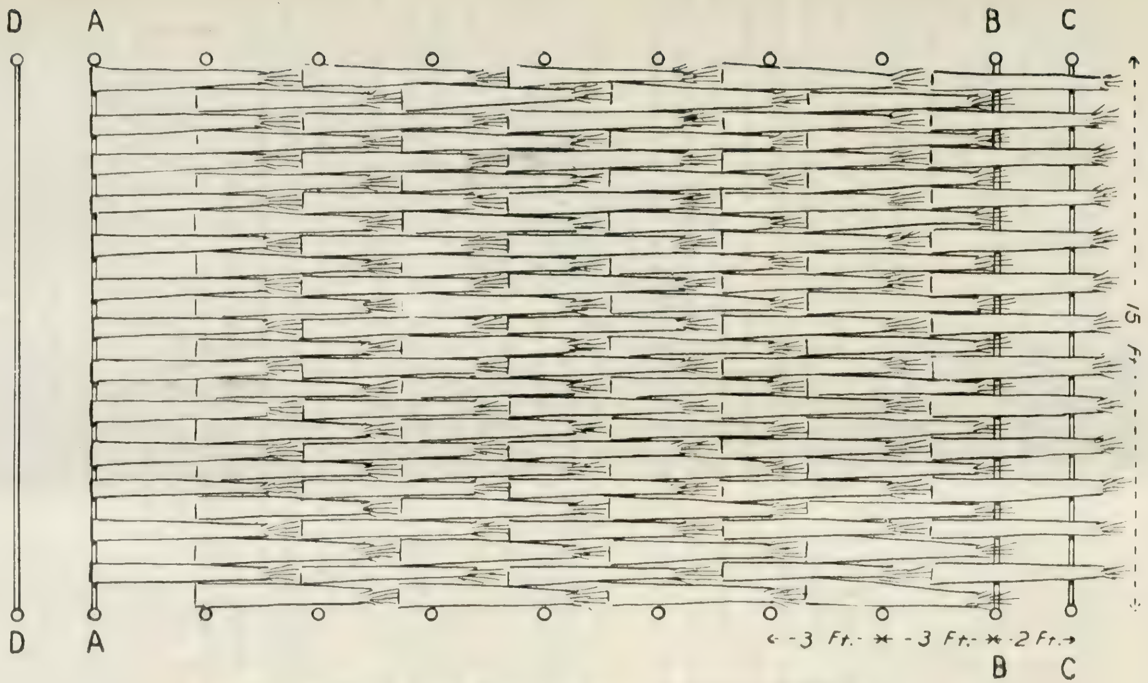


Fig. 2.—The Ground Plan of the Stack. A Diagrammatic Sketch.

The points AA and BB are the limits of the stack proper, while CC and DD represent the end poles on which are carried the crosspieces used for squaring off the material. The stack is built by laying the bundles of fodder with butts along the line AA, and overlapping them until BB is reached, the heads of the last row extending to the line CC until they are cut off at BB. For the second layer, the bundles are reversed, the butts beginning at BB, and the bundles overlapping until AA is reached, the heads of the last layer extending to DD, until they are cut off at AA.

Lucerne is not recommended as a silage crop. It is much more valuable conserved as hay than as silage; but, as is frequently the case in districts of copious rainfall, when lucerne hay becomes rain-damaged during the process of curing it can be converted into silage with advantage.

Harvesting.

To secure maximum yields and to facilitate harvesting, crops such as maize, sorghum, &c., should be drill planted and level cultivated, all hilling being avoided. The maize harvester is, of course, the last word in harvesting for silage, but until this implement becomes better known the slide and scythe-blade will be found to fulfil requirements. An illustration of this implement, which has been previously described in the *Agricultural Gazette*, accompanies this article. For small areas, broadcasted crops or steep and rocky situations, the crop may be handled successfully with a sugar-cane knife or light hand hoe, but whatever system is adopted it is essential that the stalks be kept parallel in the bundles. For transport to the stack, ordinary slides will be found most economical; a rope sling should be placed across the floor of the slide before loading, and in due course secured around the bundles, thus serving to keep the load in place and providing a grip for the lifting gear at the stack. In the cases of large slides or heavy material, it may be advisable to split up the "lift" by utilizing two or more slings on each slide.

The subject of when to harvest has been dealt with in detail in previous issues of the *Agricultural Gazette*, to which the reader is referred, but it may be briefly stated that the rule to be observed is to harvest when the crop has reached its maximum vegetative growth—in the case of maize, when the husk and lower leaves on the stalk have turned brown, and the grain has assumed its natural colour and shows its indentation but is still milky. Sorghums and millets are at their best when their seed is distinctly set. Absolute adherence to rules is, of course, impossible under field conditions and the time of harvesting must of necessity be somewhat flexible, but these facts must be observed: harvesting in an immature condition results in loss in bulk and in nutritive value, while if delayed beyond the point recommended above, there is serious risk of extreme development of heat, and the production of charred and altogether inferior silage.

Directions for Stacking.

A foundation of about 18 inches of grass or any coarse material should be placed to receive the first layer of bundles, and a start made by placing the first row of bundles with their butts in line with the end pair of uprights in the framework. Under no circumstances, however, should a timber foundation be used, as this allows air to penetrate the bottom of the stack. Successive rows of bundles, each overlapping the last, are laid until the entire floor of the framework is covered, the heads of the last row protruding from 30 to 36 inches beyond the last pair of uprights. In placing the second layer, the heads and butts are reversed, and the stacking continued in this manner. When a height of approximately 30 inches has been reached, a rough "straightedge" should be laid across the ends of the stack on the outside edges of the last pairs of uprights, and the protruding heads of the bundles cut off and thrown back into the body of the stack. This practice may not be absolutely necessary, but is strongly advised, an unbroken and compact face being thus presented to the weather, while the heads of the alternate end rows of bundles are preserved and made to swell the stack instead of being permitted to go to waste. After the first trimming has been made, the light cross pieces referred to earlier are placed into position against the additional pair of uprights at the ends of the framework so as to carry the protruding heads of the bundles of the ensuing layers. These cross-pieces carry little weight and should be easily adjustable; they can be held in place by a pair of stout forks or wire twitched to their supports. After a further 30 or 36 inches of material has been stacked the ends are again squared off with the straightedge and the cross-pieces elevated accordingly, and so on until the completion of the stack. Under ordinary conditions this operation would not be necessary more than once daily. For satisfactory results, a depth of not less than 30 inches over the surface of the stack should be put on daily; liberties in this direction can be taken with immature material, but with more matured crops speed in handling is imperative. If a portion of the crop is drier than the rest, it is advisable to place it on, or near to, the bottom of the stack and to have the heavier and greener portion nearer to the top, in order that the drier portion may be subjected to the greatest pressure, and that its deficiency of moisture may be rectified by the soakage from the upper layers of the stack. Unlike hay, silage suffers no damage from rain during stacking, and save for the inconvenience caused thereby the work may proceed under moist weather conditions without detriment to the product; it is, in fact, sound practice to apply water when stacking a crop that has attained an advanced stage of maturity. In completing the stack the aim should be to leave the centre

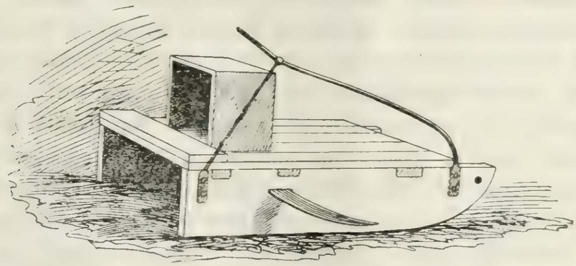


Fig. 3.—The Slide Cutter.

The scythe blade is firmly mortised into the slide. The iron bar above the blade is bent outward so that the crop (generally maize or sorghum) falls into even swathes.

slightly higher than the sides in order that a depression may not be formed by the more complete heating and settling of the central portion; this point must be carefully observed when two or more classes of crop are ensiled in one stack, and complete layers made of each.

If the bundles are placed with average care, the weather waste on the exposed surfaces should be comparatively slight; heaviest waste will necessarily be towards the top of the stack, and this can be materially reduced by the application of even a light amount of pressure. Best results in this direction are obtained by some form of winding gear, which can be successfully operated from the ends of logs embedded beneath the foundation of the stack, the weight being applied by the usual wire ropes and distributed over the surface of the stack by means of a framework of light poles, but almost anything that can be easily and conveniently handled (such as logs, stones, bags of sand or even loose earth) will give results more or less satisfactory. Whatever system of weighting is adopted, it is essential that the pressure be evenly distributed over the stack surface, and that a thick layer of grass or straw be placed directly on top of the silage. The stack can be further protected by a layer of grass on top of the weighting material, and by ridging this last layer well down the centre of the stack, an unbroken surface is presented to the weather. Experience indicates that this additional covering requires no holding in position except in exposed situations, as under the usual North Coast weather conditions, the grass "mats" very rapidly; where necessary, however, a few strands of fencing wire will give all the support necessary. When loose earth is used for the top-weight, the need for the upper covering is avoided, but the low protective layer should be increased in thickness to prevent ingress of soil from above, and poles laid around the top of the stack to hold the earth in position. For obvious reasons this system of weighting is not recommended when any other is available.

Elevating the Bundles.

The elevation of the bundles presents some little difficulty, but this can be easily overcome by any of the usual methods; a mast and spar can be used, or a block and tackle operated from an overhanging limb of a convenient tree; but the system most to be recommended is the "whipstick," as illustrated herewith. The length of the "whip" is, of course, determined by the height of the stack, but usually a pole of about 30 feet in length will fulfil all requirements. The whip, like the block and tackle, can be worked from an adjacent tree or, as is more usual, a stout pole can be erected for the purpose at the end of the stack-framework. In some instances this pole is made to take the place of the corner pole of the framework, and is of a height sufficient to swing the bundles over the end brace.

Cutting and Feeding.

In opening a stack silo the point to be observed is that silage moulds very rapidly when exposed to the air, and the correct mode of procedure is to expose the smallest portion of the inside surface and to endeavour as far as possible to renew this inside surface daily. It is usual, therefore, to open the stack at one end, and at the same time to disturb the covering and weighting system over as small an area as possible. Only small benches should be opened up, so that they can be cut right out as soon as possible. It is absolutely essential that no more than the day's ration be cut at one time, and that the cutting be clean and free from tearing. For best results the cutting should be done with an ensilage knife, but in the event of this implement not being available, a sharpened spade or an old squaring axe, or even an ordinary chopping axe may be successfully used.

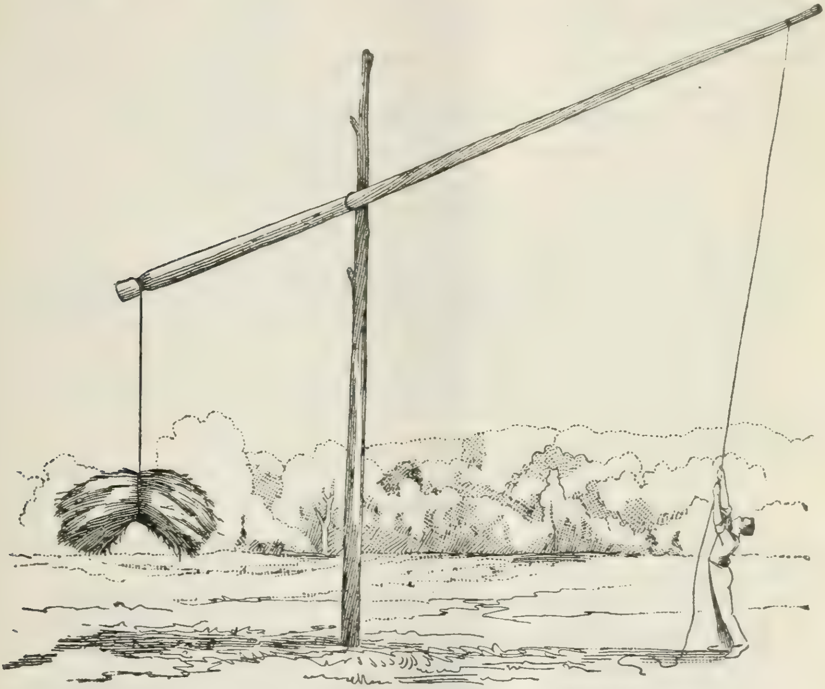


Fig. 4.—A Well-made Whip-stick.

It is not advisable to open the stack earlier than fourteen to sixteen weeks from the time of stacking, in order that the fermentative processes of curing may have time to complete their work.

It is unusual for any difficulty to be experienced in inducing stock to eat good silage; in fact, it has been observed that even the waste from the stack is readily devoured, especially when stock have become accustomed to silage, although it is not recommended that cows in milk should receive any of the weathered portions. The daily ration of silage is about 40 pounds, but for obvious reasons this point must be left to the discretion of the feeder, for if the silage is supplemented by other foods this amount would be materially reduced. Most silage is rather deficient in protein, and the addition of a little lucerne or oaten hay, copra or linseed cake, bran, or (in sugar-growing districts) small quantities of molasses will be found advantageous, especially in feeding young or growing stock.

Local conditions will always produce modifications, and experience will materially improve upon the suggestions offered here; for example, while it is not recommended that underground silos be attempted, it is possible that hillside-stacks would prove satisfactory in districts of steep conformation and loose friable soil such as Dorrigo and "the Big Scrub." On Mr. John Short's farm at Dorrigo a "ledge" was cut in a hillside and a framework erected upon it. The crop—broadcasted maize—was filled into the silo by being rolled in bundles from slides on the higher side, thus entirely avoiding all difficulties of elevation. Conditions were, however, exceptional at Dorrigo. The excavation of the ledge offered little difficulty on account of the ease with which the basalt soil of the plateau may be handled, and the crop was in a high paddock above the site of the silo.

With a silo of this type it is essential that ample protection against storm water be provided by excavating a deep drain on the hillside immediately above the silo, and that ample provision be made against water lodging on the ledge; further, that the excavation be extended beyond the ends of the framework, so that there may be no difficulty in laying and trimming the end rows of bundles.

HOW TO GROW WATTLE.

THE following is the best method of germinating wattle seed and planting out the seedlings:—

1. Collect and clean the seed; label and put away in a dry place.
2. Sow the seed during the spring months (not when collected).
3. Sow in a shallow box, flower-pot, or in open ground.
4. The soil for the box, &c., should consist of a mixture of sand, a quarter to a half of alluvial soil and a quarter of broken charcoal.
5. Sow the seed thinly and press firmly into the receptacle used, covering over to the thickness of the seed with fine sifted soil.
6. Water copiously and afford shade at the early stages of germination.
7. Finally, pot singly in flower pots, or in positions in open ground, selecting a dull or rainy day for the operation.

The young plants should be about 3 to 4 inches long when planted in their permanent positions.—J. H. MAIDEN.

DURING September, 1919, the plant *Solanum cinereum*, "Narrawa Burr," was declared by the Jemalong Shire Council to be noxious within its area.

Farmers' Experiment Plots.

SWEET AND POP CORN EXPERIMENTS, 1918-19.

Murrumbidgee Irrigation Area.

G. G. ST. CLAIR POTTS, H.D.A., H.D.D., Assistant Inspector of Agriculture.

VARIETY trials with sweet and pop corn were conducted during the past season at the following centres:—

Water Conservation and Irrigation Commission, Farm 220, Griffith.
I. Dixon, Farm 543, Leeton.
E. H. Ronfeldt, Farm 797, Leeton.

The season proved to be one of the most trying on record, presenting during the tasselling stages continual strong scorching winds, which caused weak fertilisation of the grain. The rainfall during growth was negligible, and in view of the rapid evaporation irrigation had to be practised frequently.

SWEET CORN.

Notwithstanding the fact that experiments have been conducted for one season only, the results obtained from a few varieties are most satisfactory, bringing forward the possibility of canning this crop at the local factory. In the United States of America sweet corn is in great demand as a food, and the taste is gradually being acquired in this country. At the present time most of the canned sweet corn is imported from America, and as a result the ruling prices for this product are high. An excellent opportunity therefore offers itself at this juncture for the production of a good brand of sweet corn in local factories, and in view of the necessity of profitable "pot boilers" on the areas (owing to the extensive planting of orchards) this corn will be found eminently useful. As the maturing period ranges from eleven to sixteen weeks, sowing operations could be so arranged as to allow the sweet corn to be harvested after clingstone peaches had been dealt with, thus preventing any rush either for the settler or the factory officials.

Character and Cultural Details.

In regard to the culture of sweet corn under irrigation, it is essential in the first place to prepare the land thoroughly, making provision for ample moisture to germinate the seed and working the land into a fine seed-bed. Owing to the weak germination which usually characterises this crop, it is advisable to plant six to eight seeds in hills 3½ feet apart each way, thinning out to three or four plants, and at the same time eliminating the weakest;

a dressing of superphosphate at the rate of 1 to 2 cwt. per acre can be used with profit. Constant cultivation is of vital importance throughout the growing period, and the practice of harrowing across the crop until 4 or 5 inches in height has everything to commend it. Irrigation should be carried out in furrows when necessary; on no account should the crop receive a check in growth through an insufficient supply of moisture, especially during the tasselling stages, until harvested.

The harvesting stage requires special attention. For canning purposes the grain should be slightly past the full-milk stage, a period indicated by the silk of the ear turning from brown to black. Some practice is necessary in determining the correct stage, and it would be advisable for the inexperienced grower to test a few of the ears before reaching a final decision. The cobs are picked from the stalk, discarding most of the shank but retaining the husk around the ear.

As this corn loses its flavour rapidly after being picked, provision should be made to harvest and deliver at the factory for canning purposes the same day. The varieties which proved most successful during the past season are Papago, Mammoth White, Alameda and Late Mammoth.

The Plots.

Farm 220.—The experiment was sown on 13th December in red clay loam, opening up furrows 3½ feet apart and 4 inches deep. Five seeds were dropped by hand every 3½ feet, and were covered immediately with tine harrows. The plots were not manured.

The germination throughout was rather disappointing, some varieties failing altogether, whilst Papago struck extremely well. Good growth was maintained during the season, but hot winds interfered largely with fertilisation, especially in the early varieties.

Harvesting was commenced on 3rd March and continued on 10th and 27th March and 11th April. The maize earworm made its appearance late in the season, but only to a limited extent.

Papago, the latest variety on trial, gave most satisfactory yields, largely due to good germination and to its tasselling at a period when the hot winds had passed. Alameda (an early variety) showed great promise, but was checked by the hot winds in the tasselling stages. Mammoth White and Late Mammoth germinated weakly, but these varieties are most promising canning varieties as far as the ears are concerned.

Previous crop, lucerne; prior to sowing treated with 1 ton gypsum per acre in January, 1917, and 1 ton lime per acre in June, 1918; disc-ploughed, August; irrigated, 4th December; disc-cultivated, 10th December; disc-ploughed and tine-harrowed, 12th December. Furrow irrigation was practised during growth on 27th December, 11th and 26th January, 10th and 25th February, and 13th March; cultivated 24th December, and again after each irrigation; rainfall 2¾ inches.

YIELDS of Sweet Corn at Canning Stage.

Variety.	Yield per acre.				Variety.	Yield per acre.			
	t.	c.	q.	lb.		t.	c.	q.	lb.
Papago	2	17	1	24	Golden Bantam	0	15	2	9
Alameda	1	12	2	17	White Evergreen	0	13	2	6
Late Mammoth	1	10	3	6	Black Mexican	0	12	1	8
Mammoth White	1	10	0	21	Potter's Excelsior	0	9	3	12
Ruby Sweet	1	7	2	25	Stowell's Evergreen	0	9	0	27
Crosby's Early	0	18	1	6	Golden Evergreen	0	1	3	11
Hickox Improved	0	16	0	2					

Varieties yielding less than 1 ton per acre were largely handicapped with weak germination from the outset.

Farm 543.—The experiment was sown on 14th December on red clay light loam, in rows 3½ feet apart, four grains dropped every 3 feet. The germination of Papago and Alameda was good, but the other three varieties practically failed in this respect. Papago was again fortunate in missing hot winds at the tasselling stage, but the yields of Alameda were reduced considerably by this factor.

The first cobs were harvested on 3rd March and thereafter the plots were gone over weekly three times. The plots were irrigated thrice during growth and cultivated four times.

Variety.	Yield per acre.			
	t.	c.	q.	lb.
Papago	1	11	3	9
Alameda	1	4	3	10
Stowell's Evergreen	0	15	0	10
Mammoth White	0	13	0	22
Crosby's Early	0	5	0	5

Details of Varieties.

Papago.—Germination excellent; height of stalks, 6½ feet; two to three ears per plant, cobs 36 inches from ground; narrow ears, small grain, no suckering; very late maturer (sixteen weeks); even ripening; two pickings.

Alameda.—Germination very good; height of stalks, 6 feet; two ears per plant, cobs 6 to 36 inches from ground; no suckering, comparatively large ears, broad grain; early maturer (eleven weeks); three pickings.

Late Mammoth.—Germination very fair; height of stalks, 5½ feet; two ears per plant, cobs 6 to 30 inches from ground; no suckering, cobs filled fairly well, large ears, broad grain; late maturer (fourteen weeks); three pickings.

Mammoth White.—Germination very fair; height of stalks, 4½ feet; two to three ears per plant, cobs 6 to 18 inches from ground; tendency to sucker; weak fertilisation caused by hot winds; large ears, broad grain; early maturer (eleven weeks); three pickings.

POP CORN.

A number of varieties were on trial with the object of determining whether pop corn could be grown profitably. The results of experiments conducted during last season are by no means conclusive, and if the culture of this crop is to be a sound business undertaking for the settler, either much higher prices will have to be obtained than those at present offered or the yields will have to be considerably increased. If it is decided to grow pop corn for market under these conditions, it would be advisable for the settlers concerned to communicate with pop corn manufacturers in Sydney or Melbourne to ascertain the requirements and the prices paid.

The quality of this corn produced on the areas cannot be questioned, and it is anticipated that with later sowings and more favourable seasons the yields obtained on the experiment plots can be improved. As the latest variety matures in twenty-one weeks, sowing operations should be carried out during the first week in January, earlier varieties being delayed until the middle of the month. The object of sowing late is to escape the hot winds during tasselling. The seed can be sown in rows 3½ feet apart, with four to six grains dropped every 3 feet and covered 2 to 3 inches deep. Similar cultural details to those for sweet corn may be adopted, but a word of caution is necessary about the harvesting stage. The grain must be allowed to thoroughly ripen on the stalk, as if harvested in an immature condition the popping qualities are largely affected.

The Plots.

Farm 797.—The experiment was sown 9th December, in rows 4½ feet apart, four grains being dropped every 2½ feet; a maize dropper was employed with satisfactory results. The germination throughout was very fair, and by virtue of careful attention steady growth was maintained. Although suckering is usually present to a large extent with this crop, such was not the experience on this farm. Harvesting operations were conducted during May and June. Soil, grey to light red clay loam.

Previous crop, wheat, 1917; prior to sowing, ploughed March, 1918; tine-harrowed, August; ploughed, September; irrigated, 27th November, and cultivated with spring-tooth 4th December, and harrowed twice; tine harrowed after sowing; during growth, furrow irrigated 17th January, 2nd and 19th February, 4th March, 14th and 30th April; cultivated 18th and 28th December, 21st January, 7th and 26th February, and 12th March.

Variety.	Yield per acre.		Rainfall.
	bus.	lb.	points.
White Rice	6	4	184
Black Beauty	10	20	184
Queen's Golden	12	48	258

Farm 220.—The experiment was sown 13th December, on red clay loam, in rows 3½ feet apart, three grains being hand-dropped every 3½ feet and covered 3 inches deep with harrows. Most of the varieties germinated well, except Mapledale Prolific and Miniature, the latter being a complete failure in this respect. Even growth was maintained throughout the season, and although hot winds were prevalent during the tasselling stages, these had no effect on the fertilisation of the grain, except in the case of Page's Striped Rice.

The soil treatment prior to sowing and during the growing period was identical with the sweet corn plots. Effective rainfall, 328 points. Yields :—

Variety.	Yield per acre.		Shelling percentage.
	bus.	lb.	
White Rice	16	34	80
Black Beauty	12	0	87
Queen's Golden	19	4	87
Mapledale Prolific	8	2	73
Page's Striped Rice ...	12	54	64
Golden Tom Thumb ...	Failed.		...
Miniature	Failed.		...

Details of Varieties.

White Rice.—Maturity, nineteen weeks; pearl-white grain; ears 4 to 6 inches in length, good husk covering; two to three cobs per plant, 18 to 36 inches from ground; average stalk height, 5½ feet; very little suckering. A suitable commercial variety.

Black Beauty.—Maturity, sixteen weeks; pearl type; black, broad, shallow grain, fair husk covering; cobs 3 to 6 inches in length, two to three cobs per plant, 12 to 24 inches from ground; grain set very well; average height of stalk, 3½ feet. A fair commercial variety, although the coloured types are not so popular with popcorn manufacturers.

Queen's Golden.—Maturity, twenty-one weeks; pearl type, most attractive bright golden narrow grain; cobs well filled, 5 to 8 inches in length; three cobs per plant, 18 to 38 inches from ground; average height of stalk 5½ feet, comparatively thick stems and broad leaves; husk covering weak. Most promising variety under trial suitable for commercial purposes.

Mapledale Prolific.— Maturity, nineteen weeks; pearl type, attractive white grain; narrow cobs 6 inches in length, three cobs per plant, 3 feet from ground; average height of stalk, 5 feet. A promising variety, but handicapped through weak germination.

Page's Striped Rice.—Maturity, twenty weeks; rice type, white grain with red streaks; cobs 3 to 7 inches in length, three to four cobs per plant, 12 to 30 inches from ground; average height of stalk 5 feet, red stems and husks predominating; husk covering good; yields checked through weak setting of grain.

Golden Tom Thumb.—Maturity, fourteen weeks; bright golden grain of pearl type; cobs 2½ to 3 inches long, four cobs per plant; height of stalks, 2 to 2½ feet; weak husk covering; a number of cobs failed to set grain, and the yields were not taken. This variety is more of a novelty for garden or decorative purposes and is unsuitable commercially.

Miniature.—Maturity, sixteen weeks; white rice type; cobs 3 inches long, two to three per plant, carried 18 inches from ground; average height 3 feet; husk covering good. This variety failed through weak germination, but is unsuitable for commercial purposes.

THE FERTILISING VALUE OF GREEN MANURE CROPS.

THE accompanying table, which was compiled in answer to a request from a correspondent for this information, may be of some interest generally. It must be understood that the figures are subject to considerable variation, as the composition of the crop, and more particularly the yield, will vary under different conditions. The figures are sufficiently close to average conditions, however, to enable a comparison to be made of the amount of plant food available to the succeeding crop as a result of ploughing under commonly employed catch crops.

AMOUNT of fertilising ingredients added to the soil by ploughing under certain green crops.

—	Average yield per acre.	Composition of whole plant.				Fertilising ingredients added.		
		Water.	Nitrogen.	Phosphoric Acid.	Potash.	Nitrogen.	Phosphoric Acid.	Potash.
	Tons.	per cent.	per cent.	per cent.	per cent.	lb. per acre.	b. per acre.	lb. per acre.
Cowpeas ..	7½	84·4	0·63	0·13	0·46	106	22	77¼
Oats	8	75·0	0·72	0·19	0·56	129	34	100½
Rye	8	81·9	0·32	0·17	0·60	57⅓	30⅓	107½
Red Clover ..	2	70·8	0·54	0·12	0·67	24	5½	30
White Clover ..	2	80·0	0·43	0·12	0·40	19¼	5½	18
Lucerne	3	77·5	0·58	0·12	0·50	39	8	33½
Vetches	4–6	85·0	0·36	0·10	0·45	40	11¼	50⅓
Rape	2–4	85·7	0·35	0·12	0·62	23½	8	41½

—F. B. GUTHRIE.

THE FLYING FOX SUBSIDY.

IT has been decided by the Minister of Agriculture that for the present the Government subsidy to the branches of the Agricultural Bureau, Fruit-growers' Associations, &c., for the destruction of flying foxes, which has been 10s. in the pound on the amount expended in paying bonuses at 1½d. per scalp, shall be fixed at the same rate in the pound on the sum paid for bonuses at 3d. per scalp. This increase has been approved of, as it is recognised that the cost of ammunition is very much higher than before the war, and it is desirable to assist, as far as possible, in destroying the flying fox pest.

The necessary forms of application for this subsidy are obtainable from the Under Secretary and Director, Department of Agriculture Sydne

Yields of Varieties of Oats.

J. T. PRIDHAM, Plant Breeder.

THE Algerian variety has long been the favourite oat under the conditions obtaining in general in this State, and it is safe to say it will continue to be very largely grown, except in the drier areas and in coastal districts where an earlier maturing variety is required. Algerian appears to be the most productive variety in districts of assured rainfall, especially for feeding-off purposes. Its behaviour in a less favourable season may be illustrated by quoting from Glen Innes Experiment Farm report for 1915: "Guyra yielded 42 bushels, Algerian 39 bushels, Sunrise 28 bushels, and White Tartarian about 7 bushels per acre. The quality of Guyra was excellent, that of Sunrise good, but the Algerian sample was not nearly as plump as usual, owing, no doubt, to the dry season." In this year at Cowra Experiment Farm Algerian yielded 31·7 bushels, and Guyra 34 bushels per acre. We need not here go into the characteristics of the varieties, which have already been published, except to say that Sunrise oats are seldom attacked by rust. The accompanying table gives the results of the winter fodder trials in various years at Nyngan Experiment Farm, the plots being harvested when at their greatest development for fodder.

GREEN WEIGHT per acre of Cereals cut for fodder at Nyngan Experiment Farm. Area of plots, $\frac{1}{5}$ acre.

	1915.	1916.	1917.	1918.
	lb.	lb.	lb.	lb.
Steinwedel wheat ...	3,986	10,816	1,752	3,060
Firbank wheat ...	3,596	9,632	1,584	2,384
Cape barley	......	8,388	1,328	3,304
Skinless barley ...	1,692	6,068	2,344	1,604
Rape	......	31,925	.....	Failed.
Algerian oats ...	......	15,860	2,204	5,304
Sunrise oats	3,172	12,536	3,132	3,774

The rainfall in 1915 was 618 points; in 1916, 1,021 points; in 1917, 930 points; and in 1918, 437 points.

The season 1915 was early, and some varieties made no growth to speak of, hence the omission of several weights.

In 1916 the plots were sown after a heavy fall of rain; in other years the seed-bed was dry when sowing took place.

The results are remarkable. Barley has usually been considered more drought resistant than oats, but the earliness and vigour of the Sunrise variety are evident from the table; it has a thin husk and germinates readily.

The uncertain nature of the rape crop is probably due to the difficulty of getting the small seed to germinate when the seed-bed is dry at the surface. Rape was used in the check plots until 1918, when Sunrise oats were substituted; the figures of 1918 for Sunrise represent the average of four check plots.

TABLE I.—Showing Yields of Varieties of Oats in their relative order: 1st, 2nd, 3rd, &c.

	1914.		1915.													1916.																	1917.					
	Yanco Experiment Farm.	Glen Innes Experiment Farm.	Armidale.	Wellington.	Coradgery.	Wyanga.	Tullamore.	Brundah.	Ootha.	Gunningbland.	Ariah Park.	Young.	Picton.*	Wyong *	Glen Innes Experiment Farm.	Armidale.	Tenterfield.	Ravensworth.	Tenterfield.*	Henty.	Young.	Cunningham.*	Orange.*	Albion Park (1).*	Albion Park (2).*	Milton.*	Pambula.*	Gerringong.*	Mittagong.*	Kangaroo Valley.*	Dapto.*	Glen Innes Experiment Farm.	Young	Uralla.*	Ravensworth.*	Tinonee.*	Comboyne.*	Condong.*
Sunrise	2	1	1	4	3	..	2	..	2	1	2	2	..	..	3	..	2	..	3	4	..	5	..	3	1	2	3	2	1	2	4	5	6	4	1	1	3	2
Algerian	6	3	4	2	5	2	1	2	1	2	1	1	1	2	2	4	1	2	2	1	..	4	1	2	3	3	1	3	3	3	3	2	1	2	2	2	1	1
Guyra	1	2	2	..	..	..	..	..	..	..	..	..	..	..	1	3	1	..	..	3	2	1	2	..	..	..	4	..	..	..	2	3	4	..	3	..	2	..
Lachlan	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	1	2	3	..	..	..	2	..	..	..	..	..	5	1	3	..	..	..
Ruakura	4	..	..	..	..	..	..	..	..	..	..	3	2	1	..	5	..	1	1	6	3	3	..	1	2	1	5	1	2	1	1	..	2	3	4	3	4	3
Brown Calcutta ..	..	..	..	1	4	..	..	..	..	..	..	..	..	..	..	2	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..
Red Rust-proof ..	3	..	..	4	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cape	..	..	..	3	2	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
White Tartarian ..	4	1	3	..	..	..	..	..	..	..	..	..	..	..	5	1	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..	..	..	..	..	..
Leader	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bathurst Early ..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
White Ligowo	..	5	..	..	..	..	..	..	..	..	..	..	..	..	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	..	..	..	..	..	..
Hutchinson's Potato..	..	4	..	..	..	..	..	..	..	..	..	..	..	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..
Potato	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

* Indicates hay or green fodder trial.

TABLE I.—Showing Yields of Varieties of Oats in their relative order: 1st, 2nd, 3rd, &c.—*continued.*

	1917—*continued.*																
	Dorrigo.*	Burrapine.*	Sherwood.*	Mittagong.*	Kangaroo Valley.*	Pambula.*	Albion Park.*	Milton.*	Grenfell.	Nymagee.	Orange.*	Carcoar.*	Alectown West.*	Condobolin.	Yanco Experiment Farm (1).	Glen Innes Experiment Farm.	Yanco Experiment Farm (2).
Sunrise	3	1	1	2	2	1	1	3	2	3	..	2	1	3	1	6	..
Algerian	1	2	3	1	3	3	3	2	..	1	4	5	2	1	3	1	1
Guyra	2	..	..	..	..	..	..	..	1	..	3	4	..	..	..	3	2
Lachlan	..	..	..	..	..	..	..	..	3	2	6	..	..	2	2	..	3
Ruakura	4	2	2	2	1	2	2	1	..	..	..	1	..	..	3	..	4
Brown Calcutta	..	..	..	..	..	..	..	..	..	..	5	3	..	..	.	..	..
Potato	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..
Abundance	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..
White Tartarian	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
White Ligowo	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..
Hutchinson's Potato	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	..

	1918.																				
	Pambula.*	Kangaroo Valley.*	Milton.*	Exeter.*	Wollongong.*	Gregra.	Condobolin.	Grenfell.	Alectown West.	Nelungaloo.	Nymagee.	Eurimbla.	Wellington.	Gilgandra.	Trundle.	Young.	Cunningham.	Holbrook.	Marsden.	Yanco Experiment Farm.	Glen Innes Experiment Farm.
Sunrise	1	3	3	3	2	3	3	2	1	2	2	..	..	3	4	..	..	..	2	..	3
Algerian	2	2	4	1	1	4	..	1	..	3	4	..	2	1	1	4	4	3	1	5	1
Guyra	..	..	..	..	..	1	1	3	2	4	1	3	1	2	2	3	2	2	..	1	2
Lachlan	..	..	..	..	..	2	2	4	3	1	3	2	..	..	3	2	3	4	..	4	..
Ruakura	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	1	..	2	..
Brown Calcutta	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Potato	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Abundance	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
White Tartarian	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..
White Ligowo	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Hutchinson's Potato	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

* Indicates hay or green fodder trial.

The New Zealand variety, Ruakura, thrives best on the coast; its straw is too weak for the inland districts in most seasons, though it is a heavy yielder.

As Mr. Inspector Syme points out, it is remarkable that Guyra in 1918 resisted drought better than Lachlan, which is a little earlier in ripening and stools rather less. The straw of Lachlan is stronger than that of Guyra, though the latter seldom lodges. Brown Calcutta has been discarded on account of the weakness of its straw, and varieties of the Potato and Banner class mature too late for any but the coldest districts.

Table I, which accompanies this article, gives the yields of oat varieties on the Farmers' Experiment Plots from 1915 to 1918, and also on those experiment farms that conducted oat field trials, viz., Glen Innes (from 1914 to 1918), and Yanco (1914, 1917, and 1918).

In Table II the number of times the chief varieties have given the highest yield in a given list of tests is set out, together with the percentage, as affording a rough basis for comparison. Ruakura is slightly ahead of Algerian, and these two are well in the lead; for the special qualities above mentioned, however, Sunrise and Guyra are useful varieties. Lachlan is likely to be replaced by Bathurst No. 5, which is similar to it, the straw being taller, the yield superior, and the pedigree the same. The selections from Sunrise—Cowra No. 25 and 49 (C3)—are early maturing, and are still on trial to see whether they are better than the parent variety. Cowra No. 22 matures slightly earlier than Ruakura, from which it was selected, and it has better straw.

No farmer should confine himself to one variety of oats. Although Algerian is the best cropper on the average, in a dry year the sample of grain will be much inferior to that of Guyra or Sunrise, the difference in price making up for the somewhat lower yield per acre of the earlier maturing variety. The reason is not far to seek—Algerian throws up too many stalks from each seed to mature a plump sample if the season turns out dry.

It is worth recording that from 1914 to 1918 inclusive, at the Cowra and Bathurst experiment farms, Algerian oats did not give the highest yield in any year on the stud plots, where the conditions were similar. The same uniform result was not obtained at Glen Innes, however.

TABLE II.—Highest Yields of Chief Varieties, summarised from Table I.

Variety.	No. of Trials.	No. of times Highest Yield.	Percentage.
Algerian	71	25	35·21
Ruakura	38	14	36·84
Guyra	37	10	27·02
Sunrise	60	15	25·00
Lachlan	26	3	11·53

Popular Descriptions of Grasses.

[Continued from page 722.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE SETARIA GRASSES AND THE MILLETS.

THE Setaria grasses, although containing few species, are widely distributed over the warm and temperate regions of the globe. They are very abundant in moist places during the summer months in this State, and frequently occur as weeds on fallowed lands and in summer crops. Owing to the fact that the seed of these grasses is greedily sought after by birds, the Setaria grasses are often designated as "Pigeon" grasses.

The Setaria grasses are closely related to the Panicums, recently described, but, as a rule, they can readily be distinguished by the shape of the inflorescence, which is generally compact and cylindrical, and by the presence of numerous bristles between the seeds. All the Setaria grasses found in New South Wales are distributed throughout other parts of the world, and all are very similar in appearance, and generally occupy a moist habitat, although one species, *Setaria glauca*, occurs in dry situations, and is found as far west as Gilgandra. This is an annual summer grass, which, although a palatable fodder, does not make much growth after being fed off, and its life is in consequence very short.

The most important Setaria grass in New South Wales from an economic standpoint is *Setaria italica*, an introduced grass occurring very abundantly during the summer months in moist situations. It is from this form that many of the millets are supposed to have been derived. The resemblance between *Setaria italica* and the millets in the accompanying figures is sufficient to illustrate how the latter, by a process of selection and improvement under cultivation, have been derived from the common grass, *Setaria italica*.

The millets so derived have been, and are, very numerous; as with most fodder plants, new types are continually being evolved and discarded, so that a type existing to-day may be unknown ten years hence. For example, the following are some of the millets derived from *Setaria italica* or its variety:—Foxtail, Common, Italian, Hungarian, Golden Wonder, Yellow Manchurian, White Manchurian, Siberian, Californian, Gold Mine, German, Mammoth, American, and Dakota. Of all these, only Hungarian and White and Yellow Manchurian are considered worth growing in this State, and most of them are unknown, or have been discarded.

Millets are among the oldest plants grown, being mentioned in Chinese records dating as far back as 2700 B.C. At the present time thousands of acres are grown by the yellow and black races, principally for the purpose of

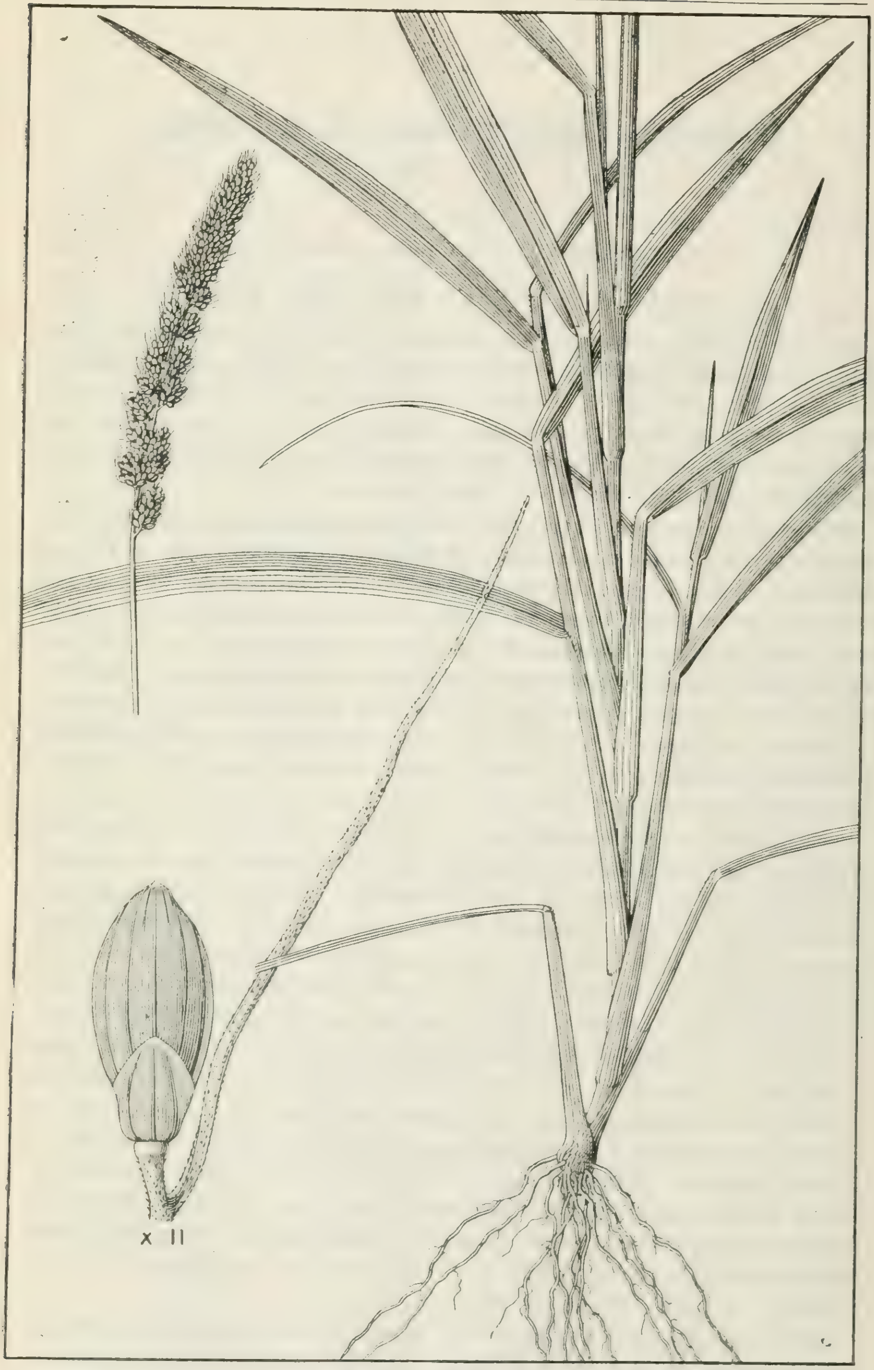


Fig. 1.—*Setaria italica.*
A typical introduced Pigeon Grass, from which the Foxtail and Hungarian Millets have been derived.

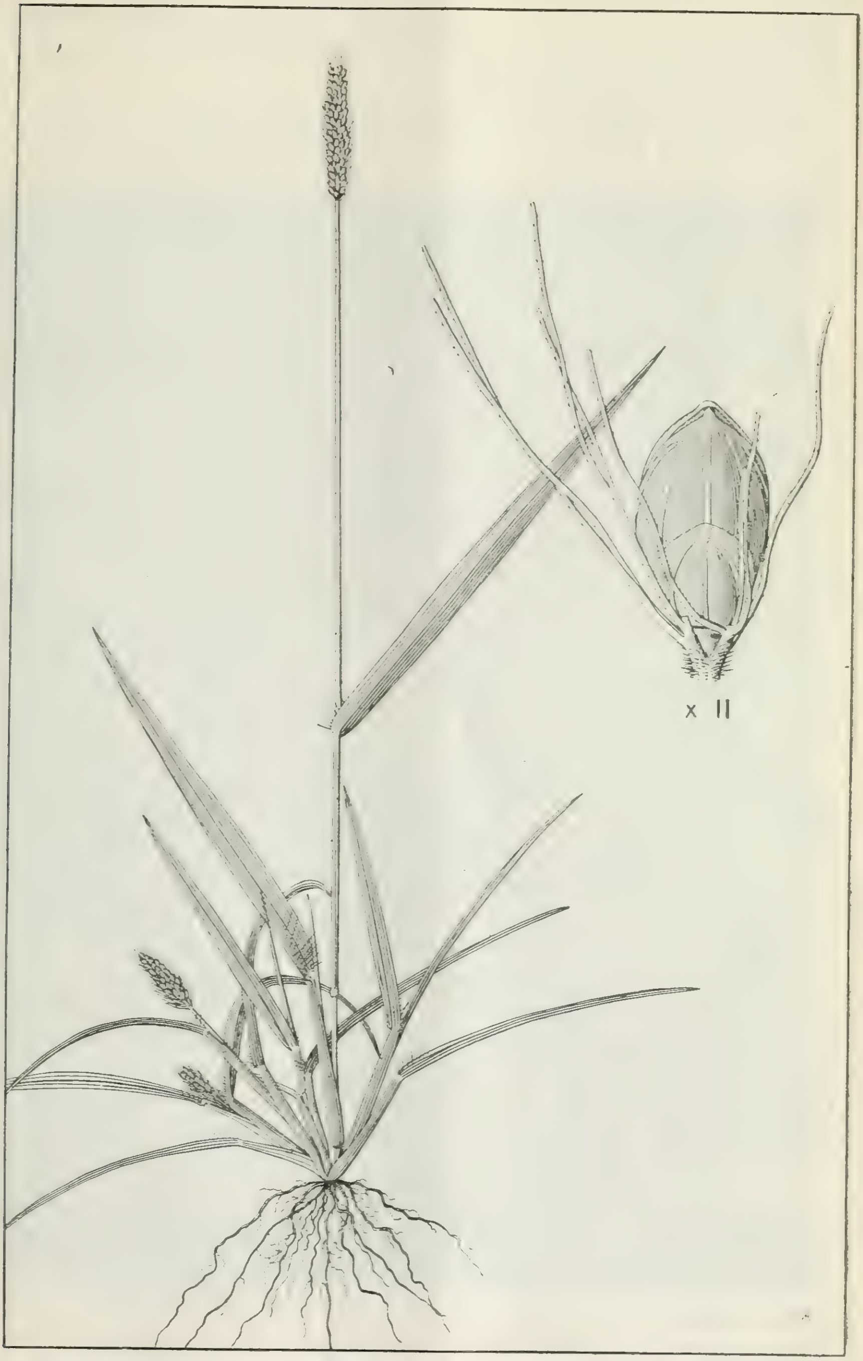


Fig. 2.—*Setaria glauca.*
A typical native Pigeon Grass.

using the seed as human food in some form. In this and other civilised countries they are grown mainly for forage, and not as a primary, but rather as a supplementary or catch crop.

The principal groups of millets are :—The Foxtail millets, derived from *Setaria italica,* or its variety *Germanica*; the Japanese or Barnyard millets, derived from Barnyard grass (*Panicum crus-galli*) and its closely allied relatives, *Panicum colonum* and *P. frumentaceum*; the Broom Corn, French, White and Red, and Proso or Hog millets, derived from *Panicum miliaceum*; and Pearl millet, derived from *Pennisetum spicatum.*

HUNGARIAN MILLET (*Setaria italica,* var. *Germanica*).

This millet has been largely grown in the past, and is recognised as the standard hay variety. One of its desirable characteristics is its aptitude for growing in dry soils; whereas most of the Foxtail millets are surface rooters, Hungarian millet can tap the subsoil for its moisture.

Hungarian millet will grow in any class of soil, but, like most quick-growing plants of this nature, it revels in soils provided with humus. An application of fertiliser prior to sowing is very beneficial. Fifteen to 20 lb. of seed per acre is recommended for coastal and moist districts, but in the western and drier districts a thinner seeding is essential. The seed may be sown broadcast or drilled. Drilling is preferable for the drier districts, as cultivation can then be carried out between the rows to conserve moisture. Sowing can be carried out from October to February, according to the most suitable time for the catch crop.

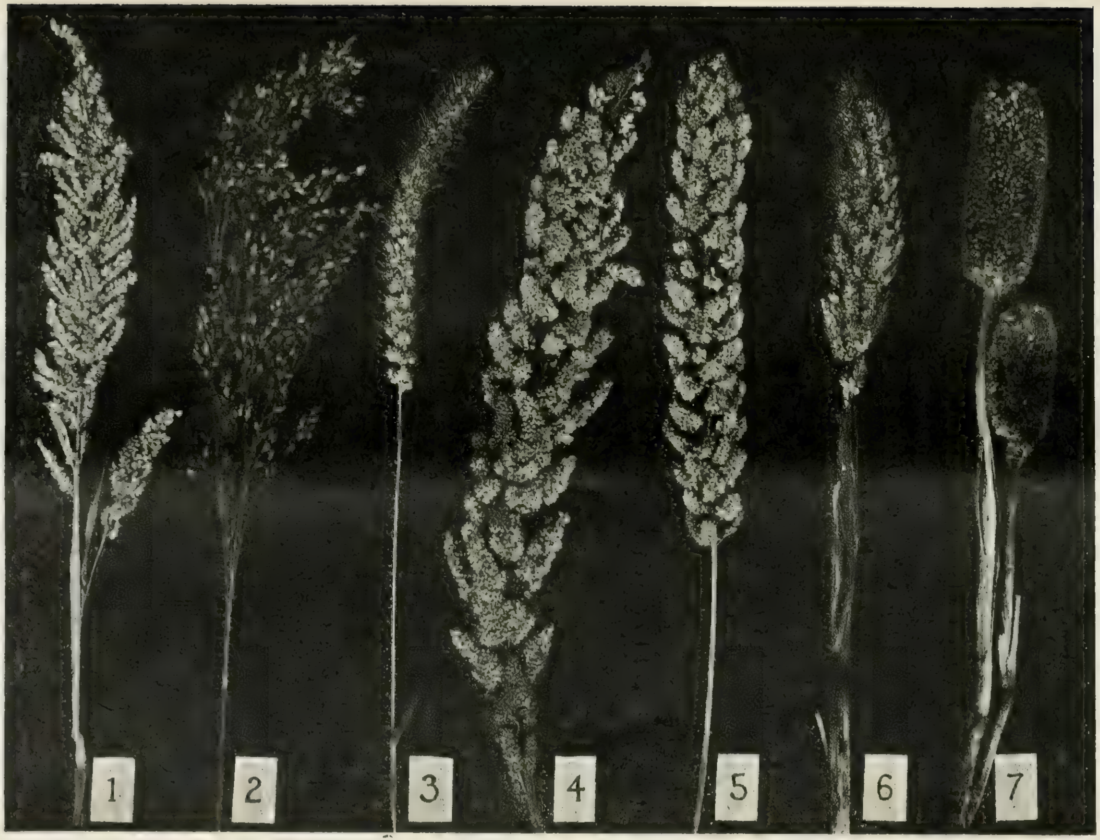
Twelve tons of green fodder per acre have been obtained from Hungarian millet on the coast, but conditions have to be particularly good for such results, and yields of 8 to 10 tons are more common. Experiments carried out many years ago at Wagga by Mr. Valder, the present Director of Agriculture, yielded 7 tons of green fodder, but this yield could hardly be expected in most years. In this experiment Hungarian millet was easily beaten in yield by Pearl millet, the latter producing 18 tons per acre.

Hungarian millet has a high feeding value, although inferior to red clover and lucerne for dairy cattle. It makes fair ensilage, but a coarse growth should be aimed at for this purpose. This millet is supposed to have an injurious effect on horses, and, although the data on this point are not satisfactory, in all cases it is preferable to feed it in combination with some other food, and to cut it before the seed is developed.

THE MANCHURIAN MILLETS.

Of these there are two kinds—Yellow and White. They may be distinguished from Hungarian millet by the larger and more drooping head, and their whole habit is also more vigorous.

Manchurian millet is admirably adapted to such moist situations as the Northern rivers, for it out-yields all other millets in such situations; similar growing treatment to that used for the Hungarian variety is required, but



Some Useful Millets.

1. Japanese Millet. } Derived from Panic grasses.
2. French ,,
3. Common Millet or Hungarian Millet. } Derived from Setaria grasses.
4. Yellow Manchurian ,,
5. White Manchurian Millet. } Derived from Setaria grasses.
6. Golden Wonder ,,
7. Pearl Millet. Derived from *Pennisetum spicatum.*

owing to its succulence it requires more time and more careful curing in making hay. Drying in the shade has proved to be very effective. Manchurian millets will not grow in the Western districts as well as Hungarian.

JAPANESE OR BARNYARD MILLETS (*Panicum crus-galli*, *P. colonum*, and *P. frumentaceum*).

All the Japanese or Barnyard millets have a resemblance to each other. The *Panicum crus-galli* form has hairy seeds provided with awns, as distinguished from the *Panicum colonum* forms, while the *Panicum frumentaceum* type has a much larger head than the other two. Japanese millet is admirably adapted to moist situations, and, in consequence, is greatly favoured on the Irrigation Areas. Under such conditions it is a first-class fodder to grow on weedy land, or as a quick-growing catch crop. The seed germinates well. Broadcast sowing at the rate of 15 to 20 lb. of seed per acre is recommended.

Japanese millet is a most palatable grass, and dairy cattle greedily eat it at all stages prior to flowering; from that time to maturity it rapidly diminishes in succulence and palatability. The seed can be sown much earlier than in the case of the other millets. The crop makes excellent hay or ensilage, yields of 15 tons per acre having been obtained from it.

THE PANICUM MILLETS.

The principal so-called Panicum millets are :—Broom millet, French millet, White and Red millet, and Proso or Hog millet. It is not within the province of this article to deal with the first named.

French millet (*Panicum miliaceum*) can readily be recognised by its drooping, typically Panic, head; it is not considered as good a fodder plant as the other millets hitherto described.

White, Red, and Proso millets (*Panicum miliaceum*) are usually grown for bird-seed. Proso yields particularly well in this respect. In a trial at Hawkesbury Agricultural College, although the plants only grew to a height of a foot, they were weighted down by seed. The yields were not as great, however, as in the case of the grain sorghums.

PEARL MILLETS (*Pennisetum spicatum* L.).

At first sight the head of this millet appears to belong to the Foxtail millets; but a closer examination reveals the fact that the seeds are joined in clusters, and the head, as a rule, is much stouter. As in the Foxtail millets, the bristles are very conspicuous. Amongst the names which, in the past, have been given to Pearl millet are :—Cat-tail millet, African millet, East Indian millet, Egyptian millet, Mand's Wonder, Mand's Wonder Forage plant, and Penicillaria. Quite a sensation was aroused some years ago by the plant being exploited under the three last names, and unscrupulous seedsmen were selling the seed at a fabulous price until the trickery was exposed.

Pearl millet is probably a native of tropical Africa, and has been grown as a forage plant for more than 300 years. It will produce an enormous amount of feed on rich, moist, and warm soils, and yields of 40 tons per acre have been credited to it in the United States. In this State, although a yield of 18 tons per acre was taken from it at Wagga Experiment Farm many years ago, nothing like these yields can be expected under ordinary conditions. For good results rich soils are absolutely essential, and on such soils farmers usually prefer to sow maize or sorghum; on poor soils it does not make sufficient growth to warrant harvesting.

Pearl millet makes hay of a fair quality, but, as with the other millets, requires cutting immediately after the blossoming period. Its chief use is for soiling.

MILLETS *v.* SUDAN GRASS.

The increasing popularity of Sudan grass promises to oust the cultivation of millets over the greater part of this State. Compared with millet, Sudan grass has many distinct advantages, viz., (1) it will produce heavier yields over a season's growth; (2) after repeated cuttings it provides aftermath pasture well into the winter months; (3) it makes hay of a finer quality and easier to cure; (4) it can be utilised as a pasture grass; (5) it will grow on poorer and much drier soils than will the millets; and (6) the seed is more easily drilled and more easily harvested.

Japanese millet appears to be the only variety which will in future be grown in certain moist localities in preference to Sudan grass. In such cases farmers may be tempted to grow it when a catch crop over a short period of time is required, and because under ideal moist conditions the first cut of the millet is a heavy one.

SOME USEFUL PUBLICATIONS.

FARMERS may obtain the following publications free of cost on application to the Under Secretary and Director, Department of Agriculture, Sydney :—

FARMERS' BULLETINS.

20. Broom Millet, 20 pages ; by G. Marks.
60. White Ants, 47 pages ; by W. W. Froggatt.
107. Wheat-breeding in New South Wales, 23 pages ; by J. T. Pridham.
112. Barley, 22 pages ; by J. T. Pridham.
117. The Testing of Pure-bred Cows in New South Wales, 32 pages ; by L. T. MacInnes.

MISCELLANEOUS PUBLICATIONS.

Points in Selection and Management of Breeding Birds (Poultry), 5 pages ; by A. L. Wyndham.
The "Yema" Graft of the Vine, 5 pages ; by H. E. Laffer.
List of Fertilisers in New South Wales, 8 pages ; by F. B. Guthrie, A. A. Ramsay and R. M. Petrie.
Tank-sinking, 4 pages ; by C. J. Woollett.
Mowing and the Use of the Scythe, 6 pages ; by H. Reid.
The Hydraulic Ram on the Farm, 6 pages ; by G. Marks.
How to set out a Right Angle in the Field, 3 pages.
The "Coolgardie" Cooler, 2 pages.

Malformation in Young Cattle.

THE RESULT OF DEFICIENT PASTURES.

THE accompanying illustrations of malformations due to *osteomalacia* might almost be left to speak for themselves, but a brief statement of the facts will probably be of interest.

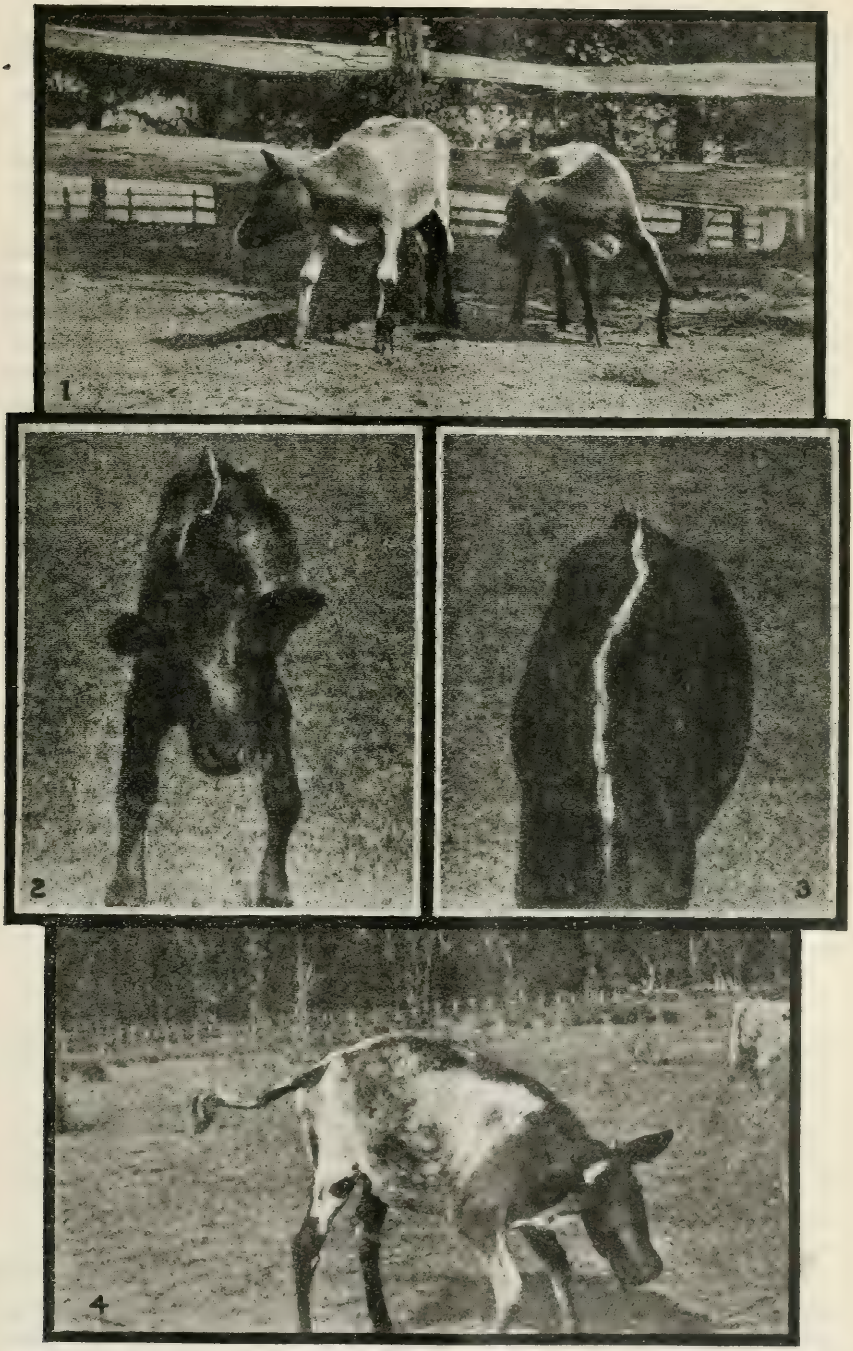
In the latter part of 1918 a communication was received by the Department of Agriculture from a farmer in the Moruya district stating that malformation had, within the last four years, become so common among the cattle on his farm that from a herd of fifty young healthy cows he had only twelve calves that were fit to rear. "The others, almost all of which had to be assisted from the mothers and came tail first, having crooked necks and legs, and could not stand, and of course had to be destroyed." It was added that the farm was purchased from the Crown sixty years ago by the present correspondent's father, and that it had grazed cattle ever since, being used as a breeding paddock up to ten or fifteen years ago, when it was diverted to dairying.

The correspondence being referred to Mr. S. T. D. Symons, Chief Inspector of Stock, the farm was visited by Mr. H. L. Mater, Inspector of Stock at Braidwood, who took the photographs now reproduced.

The impression first formed was that it might be a case of "atavism," which is the recurrence or tendency to recur to an ancestral type or to any ancestral deformity or disease after its disappearance for one or more generations, but considering the cows are all of various breeds, and that neighbouring farmers who have land adjoining have had similar experiences for a number of years, this theory was soon discarded.

The fact, however, that in 1909, in company with Dr. H. I. Jensen, Mr. Mater had visited this same district in connection with *osteomalacia,* or bone-chewing, in cattle, furnished what was undoubtedly the true reason. The report upon the inspection of 1909 stated that "owing to its poverty in lime minerals the soil is rather poor and easily exhausted. It is to be expected that soils overlying acidic (granite) rocks will be exhausted before those over limed basic (granite) rocks; possibly, therefore, the exhaustion of the soil and overstocking are the chief causes of bone-chewing."

That geological formation may be used as an indication whether a soil will stand depasturing for a long term of years or not, there is little doubt. On acid granites one may safely forecast an outbreak of bone-chewing or stiffs, however productive the land may seem in its virgin state. It is stated that in that locality fifty years ago splendid fat bullocks were produced, but now, owing to the exhaustion of the soil and absence of chemicals necessary to the production of nutritious grasses, cattle are reared with difficulty where the exhaustion is greatest, and bone-softening, stiffs, or bone-chewing, known as to *osteomalacia,* is much in evidence in certain seasons.



Malformation in Young Cattle

1. Two cases of twisted necks, with bowed legs. 2 and 3. The spinal column has been marked with chalk in each case to emphasise the curvature. 4. Another case of twisted neck.

In order that the phenomena might be thoroughly investigated in the interests of the farmers in the locality, Dr. S. Dodd, of the Veterinary Pathological Laboratory at Sydney University, was appealed to, and he pronounced the animals examined to be suffering from *osteomalacia,* "the deformities being of various natures, some with bowed legs, twisted necks, or crooked spine. Of the eleven calves surviving, four were seen to be very markedly affected, three with pronounced curvature of the spine in various directions."

Dr. Dodd's report continued:—"I further inspected a paddock containing about forty-eight cows. Some of these were pronouncedly affected, others only slightly, the latter being shown by a slight tenderness on the hoofs and in the joints on first moving. A few were very badly affected, being emaciated, with stiff gait, swollen joints, and other signs of *osteomalacia.* One cow showed pronounced lateral deformation of the spinal column (*scoliosis*). A few bullocks were running in the same paddock, but no marked symptoms were seen in them. This is quite in accordance with the usual features of this disease, where it is the parturient female which suffers the most severely."

The condition was not entirely of recent occurrence, but the drought then existing may account for the increase in its severity, the local deficiency of bone-forming constituents in the soil being more in evidence when green or nutritious feed was practically unobtainable in the district.

Instructions were given the farmer most concerned about feeding bone meal to his cattle, and if they are carried out continually and conscientiously the condition ought to be very considerably ameliorated. The suggestive remark was added—and it is interesting to many on the South Coast —that "it appears that the owners of affected cattle often consider it necessary only to feed the visibly affected animals. This is an error. On country where the disease occurs all bovines should be given a small amount daily in order to counterbalance the lack of bone-forming constituents in the soil. It is merely an instance of prevention being better than cure."

CEREAL SEED PRICES FOR THE COMING SEASON.

THE following prices have been fixed by the Under Secretary and Director of Agriculture for cereal seed during the coming season:—

Wheat	7s. 6d.	per bushel	f.o.r. for sales within the State
Do	10s.	,,	f.o.r. for sales outside the State.
Oats	6s.	,,	f.o.r.
Barley	6s.	,,	,,
Rye	5s.	,,	,,

PRICES FOR QUEEN BEES.

THE prices to be charged at Hawkesbury Agricultural College and Wauchope Government Apiary for queen bees during the coming season have been fixed by the Under Secretary and Director at 6s. (untested) and 8s. 6d. (tested).

Quantity and Quality of New South Wales Butter, 1917-19.

L. T. MacINNES, Dairy Expert.

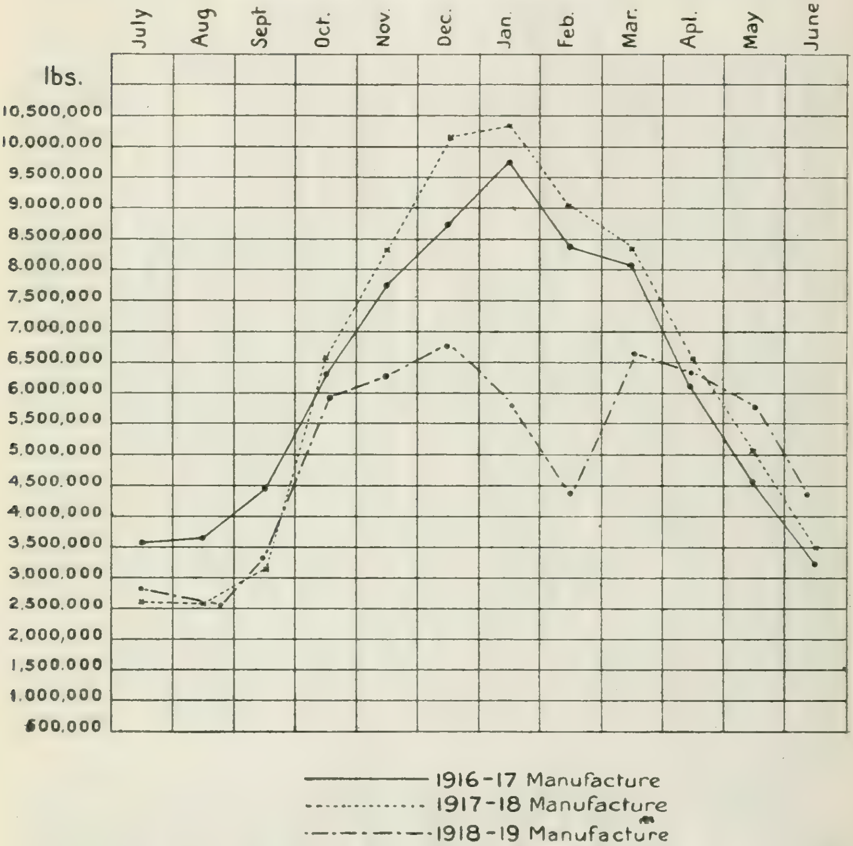
THE accompanying statements and graphs, compiled in the office of the Dairy Branch, show the monthly and yearly comparisons of butter manufactured in factories in New South Wales during the past two years. The figures have been obtained from the monthly statements as provided for in the Dairy Industry Act, and the graphs were prepared by Mr. W. B. Hickey.

An analysis of these figures will reveal the fact that, with the exception of August, when the percentage was the same, each month of the year ended 30th June, 1919, shows an increase in the percentage of choicest quality over that of the corresponding month of the previous year. On the whole year's output this increase amounts to 4·4 per cent., made to a large extent at the expense of first grade; second grade for the same year shows a decrease of 1·3 per cent. The total output for the year 1918–19 is 19·5 per cent. less than that of the year 1917–18. It will be noticed that the droughty conditions which prevailed during the summer months in the principal butter-producing districts of the State were reflected in the output, the production for February, 1919, being less than half the quantity produced in February, 1918. Comparing the qualities of butter manufactured since the introduction of the Dairy Industry Act in 1916, it will be seen that for the year ended 30th June, 1918, choicest quality butter showed an increase of 3·6 per cent., as compared with the previous year. As already stated, during last year a similar increase of 4·4 per cent. over the period 1917–18 took place, making a very appreciable increase in the percentage of "choicest" within the last two years.

Considering that this increase is based on the high standard of 77·6 per cent. choicest, recorded in the year 1916–17, great credit is due to all concerned in the production and manufacture of New South Wales butter; the more so as, in fixing prices for local markets, the Commonwealth Government did not recognise any quality higher than first-class (90 points), thus giving no monetary inducement to the manufacture of a higher grade. The percentage of choicest quality (85·6), as shown by last year's figures, is so high that it will make it very difficult to show even a slight improvement in the future. It is only reasonable to expect that a small percentage of the cream delivered for treatment at the factories will continue to be of inferior quality. Although the rate of increase may be lessened, there is hope that in the near future the amount of choicest quality butter produced in New South Wales will reach 90 per cent.

Frequent mention has been made by other authorities and in other States of the superiority of New South Wales manufacture to that of the rest of Australia. These figures emphasise that point, the more so as they cover a season of drought.

GRAPH showing Monthly Output of Butter in New South Wales for the years 1916–17, 1917–18, and 1918–19.

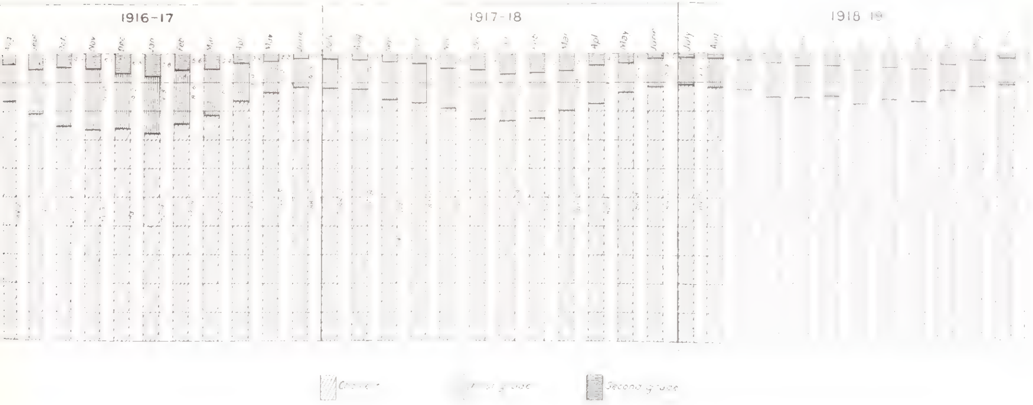


Quality Compared with Previous Years.

Prior to April, 1916, no figures are available as to the quality of the butter made in this State's factories, but we can arrive at it approximately from the quality exported overseas under the Commerce Act regulations. From records available in connection with the grading and examination of overseas exports prior to 1916, it has been ascertained that the percentages were as follows :—

1909–10—Only 43·3 per cent. of the butter exported was first grade and over.
1910–11—Only 49·8 per cent. of the butter exported was first grade and over.
1911–12—Only 53·6 per cent. of the butter exported was first grade and over.
1913–14—Only 40·7 per cent. of the butter exported was first grade and over.

GRAPH showing Quality of New South Wales Butter, month by month, for the years 1916-17, 1917-18, and 1918-19, as graded under the Dairy Industry Act.



No record was kept in 1914–15 of butter exported. Twenty-five per cent. of the total (which included the most inferior) was ungraded; of the graded balance, 60 per cent. was first grade and over. The year 1915–16 was one of drought and there were consequently no appreciable exports.

These results indicate the quality of our butter prior to the introduction of the Dairy Industry Act. Immediately following its operation a great uplift in quality took place, and for the year 1916–17, 81 per cent. of the total butter exported from New South Wales was first grade and over. Another point that might be emphasised in connection with the high percentage of choicest butter manufactured during the past year is that it was marketed both locally, in other States, and in England under a classification common to the whole State, namely, " choicest." Thus 85·6 per cent. came under this heading, 10·8 per cent. being classified and described and bearing the description of " first quality " on each package, and 3·6 per cent. only was of " second quality." Each description is indelibly impressed on the package in which the butter is marketed.

Uniform Quality Plus Makers' Identity.

The method adopted in New South Wales under the Dairy Industry Act of dividing the different qualities of the butter manufactured into four classifications, and making it compulsory to place one of those classification descriptions on each package, has enabled this State to place its product on the markets of the world under a system closely corresponding with that of the Danish manufacturers, with this added advantage : that while the word " Australia " appears, the identity of the State is also evident and—what is more important—the manufacturing company is also identifiable. While in a small country like Denmark, the range of which from north to south only covers a few score of miles, it might be possible to market butter under a common brand owing to the flavour and colour being similar in all districts, in New South Wales—with a range from north to south of over 500 miles and a climate embracing the semi-tropical North Coast and the far colder regions of the South Coast and Monaro tablelands—the variety in flavour and colour is apparent, even though the variations have been reduced to a certain extent by the introduction of pasteurising methods. This difference in climate and pastures is more evident when the whole coast-line of Australia over which dairying operations are conducted (from near the Gulf of Carpentaria in the far north, to Tasmania in the far south—from the tropics to almost the fringe of the frigid zone) is taken into consideration. It is reported that the neighbouring States of Queensland and Victoria intend at the earliest possible moment to pass legislation enabling their butter to be placed on the market under quality names or classifications similar to those in use in New South Wales, and at the same time to make similar standards to cover each quality. When this is brought about, the great bulk of the butter manufactured in Australia will be marketed under practically a uniform trade description as regards quality, while at the same time the identity of Australia and each State and factory will not be lost sight of.

While a certain quantity of the butter has been found on examination by official graders to be incorrectly described as regards quality, and the description on the package has had to be altered to correspond with the quality of the contents as ascertained by the official grader, the number of boxes so amended has not been sufficient to materially affect the quantities and percentages tabulated in each grade.

The following figures, comparing quantities and qualities of factory butter manufactured in public factories in New South Wales each month during the years 1917–18 and 1918–19, have been compiled from monthly statements furnished under the Dairy Industry Act by the various factory managers:—

1917–18.

Month.	Choicest.		First Grade.		Second Grade.		Total.
	lb.	Percentage.	lb.	Percentage.	lb.	Percentage.	lb.
July ...	2,359,605	88·2	263,631	9·9	50,423	1·9	2,673,659
August ...	2,318,655	87·8	271,270	10·3	50,473	1·9	2,640,398
September...	2,644,018	84·1	419,254	13·3	80,796	2·6	3,144,068
October ...	5,530,183	83·0	907,176	13·6	225,644	3·4	6,663,003
November ...	6,822,607	81·0	1,180,537	14·0	415,405	5·0	8,418,549
December ...	7,935,096	77·7	1,680,894	16·5	596,031	5·8	10,212,021
January ...	7,942,226	76·8	1,675,438	16·2	720,009	7·0	10,337,673
February ...	7,108,255	77·8	1,394,698	15·3	633,491	6·9	9,136,444
March ...	6,807,586	80·2	1,175,836	13·9	500,780	5·9	8,484,202
April ...	5,408,461	82·9	854,076	13·1	258,104	4·0	6,520,641
May ...	4,344,215	86·8	507,990	10·2	150,216	3·0	5,002,421
June ...	3,008,456	88·6	337,369	9·9	49,256	1·5	3,395,081
Total ...	62,229,363	81·2	10,668,169	13·9	3,730,621	4·9	76,628,160

1918–19.

July ...	2,524,580	89·9	255,268	9·1	29,880	1·0	2,809,728
August ...	2,253,438	87·8	271,978	10·6	39,831	1·6	2,565,247
September...	3,233,149	86·4	426,066	11·4	82,782	2·2	3,741,997
October ...	4,980,357	84·2	734,041	12·4	202,391	3·4	5,916,789
November ...	5,332,459	83·6	759,056	11·9	289,777	4·5	6,381,292
December ...	5,668,344	84·6	730,293	10·9	302,496	4·5	6,701,133
January ...	4,791,495	82·9	639,839	11·1	349,441	6·0	5,780,775
February ...	3,727,776	84·5	471,224	10·7	209,711	4·8	4,408,711
March ...	5,519,919	83·6	761,344	11·5	321,242	4·9	6,602,505
April ...	5,554,526	86·3	669,448	10·4	209,353	3·3	6,433,327
May ...	5,191,731	88·5	532,595	9·1	138,722	2·4	5,863,048
June ...	3,975,056	89·3	410,017	9·2	65,878	1·5	4,450,951
Total ...	52,752,830	85·6	6,661,169	10·8	2,241,504	3·6	61,655,503

INCREASES and Decreases expressed in Percentages.

Month.	Percentage of increase or decrease in quality compared with previous year.						Percentage of increase or decrease in total production compared with previous year.	
	1917–18.			1918–19.			1917–18.	1918–19.
	Choicest.	First Grade.	Second Grade.	Choicest.	First Grade.	Second Grade.		
July	10·8	(−) 9·4	(−) 1·4	1·7	(−) 0·8	(−) 0·9	(−) 24·3	5·9
August ...	4·4	(−) 2·8	(−) 1·6	......	0·3	(−) 0·3	(−) 25·3	(−) 2·8
September ...	5·2	(−) 2·5	(−) 2·7	2·3	(−) 1·9	(−) 0·4	(−) 29·7	19·0
October ...	7·8	(−) 6·3	(−) 1·5	1·2	(−) 1·2	......	4·5	(−) 11·1
November ..	7·1	(−) 7·0	(−) 0·1	2·6	(−) 2·1	(−) 0·5	8·8	(−) 24·1
December ...	3·7	(−) 2·7	(−) 1·0	6·9	(−) 5·6	(−) 1·3	16·0	(−) 34·3
January ..	4·4	(−) 3·6	(−) 0·8	6·1	(−) 5·1	(−) 1·0	6·3	(−) 44·1
February ...	2·0	(−) 3·3	1·3	6·7	(−) 4·6	(−) 2·1	8·2	(−) 51·7
March... ...	1·7	(−) 2·2	0·5	3·4	(−) 2·4	(−) 1·0	2·8	(−) 22·2
April	(−) 0·3	(−) 0·3	0·6	3·4	(−) 2·7	(−) 0·7	4·6	(−) 1·3
May	0·3	(−) 1·1	0·8	1·8	(−) 1·2	(−) 0·6	10·9	17·2
June	0·1	......	(−) 0·1	0·7	(−) 0·7	......	5·6	31·1
Total ...	3·6	(−) 3·4	(−) 0·2	4·4	(−) 3·1	(−) 1·3	2·4	(−) 19·5

(−) Signifies decrease.

HONEY A NATURAL SWEET.

THE time was when honey was our only sweet, and mead or honey ale was the principal drink. In those days practically everybody kept bees, and sugar was unknown in the land. The disappearance of the beehive from the cottage garden has been particularly hard on the children, for the little ones have natural tastes as yet unspoilt by tobacco, alcohol and sauces, and they have a craving for sweets. In modern times this is commonly met by the products of the confectioner, most of which are injurious to both teeth and digestion. Honey remains the most wholesome of sweets, and wise are those parents who supply it to their children.—JOHN ANDERSON, M.A., B.Sc., North of Scotland College of Agriculture.

THE SUPPLY OF POTASH.

ORCHARDISTS and others who are looking forward to the end of the potash shortage caused by the war, and to the utilisation of their share of the shipment of it reported to be now on the water, are reminded by the Department's Chemist that the potash salt now expected is chloride, whereas that hitherto on the market was sulphate. The Department has had no experience with chloride of potash, which must therefore be regarded as being on its trial.

Replying to a recent specific inquiry on this subject, the Fruit Expert stated that it would not be too late to apply the potash to a citrus orchard in February next. Application might be made at the rate of 1½ lb. per tree.

SOIL AERATION UNDER IRRIGATION CONDITIONS.

SUMMARISING recent investigations on soil aeration, the *Agricultural Gazette of Canada* (May, 1919) records with regard to flood irrigation as practised in Northern India, that on fine alluvial soils it is found to interfere with their ventilation by rapidly destroying the texture, and by forming a compact surface crust impermeable to air. One limiting factor—water—is removed, but another—the need of aeration—is introduced. Thus over-irrigation actually diminishes the yield. This is shown by results obtained at Quetta, where thirteen maunds of wheat were obtained with one irrigation, and only eight maunds where three irrigations were given. In any flood irrigation system, a practical compromise between the needs of the plant for air and for water must be worked out. This has been accomplished at Quetta by the proper utilisation of the preliminary watering given before sowing. Under this new system, the yields obtained are often higher than those obtained with the six or seven waterings usually applied. The Quetta results have been shown by experiment to apply to the Punjab and Sind, where almost half the irrigation water now used could be saved. The economic significance of these results becomes apparent when it is remembered that the annual revenue derived from irrigation works in India is £5,000,000.

TO PRESERVE BUILDING TIMBERS.

How to get the longest term of service from the timber with which he does his building is an ever-present problem to the farmer, whatever his soil or climate. The principal reason of decay of hardwood timbers in this country, when used for such purposes as fence posts, shed posts, foundation blocks and similar purposes, is the fact that they are usually set in position when green. If seasoned wood could be procured, decay could to a large extent be prevented. The best plan is to well char such timbers from the bottom ends to at least 6 inches over the ground line, and to further improve them by coating them with hot tar, allowing this to set hard before placing the timbers in position.

As a preventive against white ants, the site on which the building is to be erected should be carefully cleared of all stumps, roots and dead wood, and may also be ploughed (say 6 inches deep) over the whole area to be covered by the building. The floors should be 24 inches above the ground, and each stump or support should be capped with tin or galvanized iron, projecting and turned down at least 2 inches all round.

All joists, plates, bearers and other timbers under the flooring should be coated with two coats of wood-preserving oil, special care being taken that all ends are properly done. To each gallon of oil put 1 lb. of Paris green, and keep stirred while being used.—A. BROOKS, Works Overseer.

BE careful of the lime-sulphur left over from last season, especially if only a small quantity remained in the barrel. One such remnant tested by me recently went 36 deg. Baumé, a rise of 4 degrees, due no doubt to evaporation through the barrel, thus increasing the density of the remainder.—J. H. THORP, in *New Zealand Journal of Agriculture.*

Fodder Crops for Dairy Farmers.

Central and North Coast Districts.

J. M. PITT, Assistant Inspector of Agriculture.

THE Central and North Coast districts of New South Wales have long been recognised as the richest and most productive of the State. Coming under subtropical influences, the rainfall varies from 3 feet to 8 feet annually, the higher falls occurring nearer the seaboard. This, added to the extremely fertile flats along the various rivers, and the undulating pasture lands in between, makes the district literally a dairyman's and agriculturist's paradise—so much so that within a few decades the output (chiefly from the dairying industry) has increased out of all proportion to any other part of Australia. Most of this has been brought about by the introduction of paspalum, which found conditions of soil, temperature and moisture so suitable that it spread from the highest peak to the lowest swampy regions. With this abundance of food available, cattle were introduced, and bred to such an extent that something like 400,000 are now depastured within the area, which is approximately equal to 60 per cent. of the total number of dairy cattle in the State.

Not only that—the farmers became so accustomed to having most of the work done by nature that the idea of growing fodder crops was quite out of the question. But this state of affairs has just about reached its limit. Paspalum in many quarters has outgrown its usefulness; a close, short, matted stand now takes the place of the former luxuriant growth; moreover, rain falling on these matted places fails to penetrate sufficiently, and the pastures are unable to withstand even a short period of dry, hot weather. It is because of this, and also because paspalum is solely a warm weather grass, that there are such a great number of poorly conditioned cattle to be seen in the late winter and spring months of the year on the coast. Hence the farmer finds himself in the position of having to build up "condition" (should a favourable season eventuate), instead of his cows being ready to come into full milk in immediate response to improved growth. Granting that a certain area of pasture is necessary on all dairy farms for the grazing of dry and young stock, there is no doubt that many of the hardships of dairying in those districts could be overcome by the growing of fodder crops on the thousands of acres of alluvial river flats now unnecessarily under pasture.

By carrying out trials extending over a period of ten years on farmers' experiment plots, the Department of Agriculture is now in a position to place before farmers a list of crops that can be recommended for all seasons of the year. Many farmers have already benefited by such information, but far too many are still depending upon nature.

Cultivation.—Too much emphasis cannot be placed upon the importance of preparing the land thoroughly. The old proverb, " a thing worth doing is worth doing well " applies right here. In a district subject to dry spells during the spring and early summer months the conservation of moisture must be aimed at. Deep ploughing in the autumn, with a period of fallow during the winter, followed by a shallower ploughing prior to sowing, is sound policy for the spring crops. Thorough preparation should also be made for autumn sowings, although the rainfall is more certain for these crops. The longer the interval between crops the better, and the wearing out of the fertility of one piece of land by growing too many of a similar class of crop should be avoided. Holdings are not so small that spelling of some portion cannot be adopted.

Only sound seed should be sown, for numerous failures have been experienced by using inferior seed.

Spring Crops.—The most popular fodders grown for summer planting are maize and sorghum. Of the former, Improved Yellow Dent, sown at from 20 lb. to 25 lb. in 3 feet drills has given most satisfactory results, both in regard to yield and quality of fodder. The stalks, besides being sweeter and more palatable than most varieties, have the advantage of holding the sap longer. The best time to cut for fodder is when the grain on the cobs is just past the milk stage. A succession of small sowings is recommended.

Of the sorghums, Planter's Friend is grown extensively, both in drills and broadcast, the former method being preferred owing to the opportunity afforded for cultivating. A sowing late in February provides splendid late winter fodder; the frosts catch the crop just in the head, and the sap is held in the stalks.

Saccaline, a finer type of the sorghum family, is recommended; it has the advantage of giving a better second and third growth than the other varieties, and at Wollongbar has grown the second year without resowing.

Sudan grass has given remarkable results all over the State, and it is strongly recommended to dairymen. The best results are obtained by sowing in drills. It can be grazed, used as a soiling crop, or cured for hay. Fed in conjunction with a little lucerne (the latter probably grazed), it is hard to beat as a milk producer.

Japanese millet is useful as a catch crop. If sown early in September, it can be grazed when a foot high, if fodder is scarce, and whilst crops such as cow corn, Sudan grass, &c., are making headway. Sown in January and February, it also makes a fine early winter fodder.

Cowpeas are a useful crop, both for cow feed and for green manure. They can be sown alone in the spring, or in the maize crop. If sown before the last cultivation, they should be hand-sown in the rows between the hills of maize and covered with a hoe; if sown at the same time as the last cultivation they can be broadcasted through the crop.

Autumn Sowings.—Fodders sown at this time of the year are available during the winter and spring months when pastures are dormant and cows are in need of ample fodder to keep up their condition, and also to enable them to come into full milk earlier than would be the case were no supplementary fodder available. Yet farmers, on the whole, fail to bear this in mind. The autumn crops offer a wide choice.

There are a number of varieties of wheat suitable for fodder, and yields of up to 16 tons per acre have been obtained on several farms. Clarendon, Florence, Firbank, Thew, Warren and Huguenot, in that order of maturity, are the most tried varieties—Thew and Huguenot probably being more extensively grown than the others. In a dry winter, wheats give more satisfactory results than oats or barley. Two bushels per acre are recommended for broadcasting.

Oats have also given exceptional yields, particularly Algerian and Sunrise. The former can be grazed several times when planted early, and the subsequent growth can be allowed to grow into green fodder or hay. Sunrise is an earlier maturer and a ranker grower, frequently reaching 6 feet in height. The habit of growth lends itself admirably to the inclusion of a legume. Ruakura has also given good yields.

SOWING TABLE of Green Fodders, Central and North Coast Districts.

Crop.	When to Sow.	Quantity of Seed per acre.	How to Sow.	Available for Grazing or Cutting.
Maize	Sept. to Jan.	20 lb. to 25 lb.	Drills 3 feet apart	December to May.
Sorghum	Sept. to Feb.	30 lb. to 40 lb. 9 lb. to 12 lb.	Broadcast Drills, 3 feet	December to August.
Saccaline	Sept. to Dec.	10 lb. to 12 lb.	Drills, 3 feet	December to August
Sudan Grass	Sept. to Jan.	8 lb. to 10 lb.	Drills, 3 feet	November to June.
Japanese Millet	Sept., Jan., and Feb.	8 lb. to 10 lb. 8 lb. to 10 lb.	Drills, 3 feet Drills, 3 feet	November-December April to June.
Cowpeas	Nov. and Dec.	10 lb. to 15 lb.	Broadcast or drills	January to May.
Wheat Oats Barley Rye	March to June	Alone, 2 bus. With legume, 1½ bus.	Broadcast	June to November.
Field Peas and Vetches	March to June	Alone, 60 lb. With legume, 30 lb.	Broadcast	June to October.
Rye Grass and Common Clover.	Jan. to March	Rye 30 lb. Clover, 6 lb.	Broadcast	March to September.
Lucerne	April to June	15 lb. to 20 lb.	Broadcast	Perennial.

Probably the best cow fodder, and one that can be strongly recommended to all, is a mixture of wheat or oats with vetches or field peas. There is no doubt this mixed fodder is a great milk producer. Vetches and field peas are sown in some situations alone, but with the addition of the cereal the legume is given a " ladder " on which it grows, resulting in a much greater yield. The mixtures recommended are 1½ bushels of wheat or oats to half a bushel of the legume; sow broadcast. Huguenot wheat, and Sunrise and Algerian oats, owing to their robust growth, are suitable for this purpose.

Rye is a useful crop for supplying early spring fodder, and can be fed off a number of times. On the poorer classes of soils it sometimes yields heavier than the other cereals. If allowed to reach maturity it loses its value.

Lucerne, of course, should be available on all dairy farms. Its value is too well known to require further note. Although sowings are best made in the autumn, it is really a summer cropper, though in favourable seasons ample green fodder can be obtained from a stand in the winter. A thoroughly clean seed-bed should be prepared, and 15 to 20 lb. seed used broadcast. Mention may be made of the value of top-dressing lucerne stands with 1 to 2 cwt. of superphosphate early in the spring.

Crops such as pumpkins and mangolds are used in some places as cattle feed, and are useful in making up rations. Prairie grass, rape and elephant grass are also useful where available.

TO STORE OATEN OR WHEATEN HAY.

OATEN or wheaten hay will keep in good condition for many years if pressed, baled and protected from rain. The Department kept some in sound condition for several years, during which time it went through two mice plagues; when the hay is pressed tightly, the mice will not cause any loss.

It is advisable to cut the crop at an early stage—that is, when the grain is about half-formed.—A. H. E. McDONALD, Chief Inspector of Agriculture.

THE EUROPEAN MAIZE BORER.

THE authorities in both the United States and Canada are alarmed at the spread and increase of a moth commonly known as the "European corn borer" (*Pyrausta nubilalis* Hübn.), a maize-destroying pest which might very easily be introduced into the Commonwealth.

This moth is considered to be a recent importation from Europe with hemp (which it also infests like maize), but in 1917 it was found to have become established over an area of 100 square miles in the State of Massachusetts, and quarantine measures affecting it have since been passed by the State and Federal authorities in the United States.*

The Canadian Department of Agriculture has issued a warning poster to the maize-growers of the Dominion showing the action of the caterpillar on the plants. It attacks maize, potatoes, oats, fodder and garden crops and is recorded as a pest throughout Europe, Northern Asia, China, Japan and the Philippine Islands. The eggs are laid by the moth on the stems or tassels of the corn cob, the caterpillars feeding on the stem and pupating in the base just above the ground. Holes in the stalks of maize or sorghum, with sawdust-like material issuing from them, or broken tassels show where the entry has been made by the borer, and if such indications are seen the stems should be split open and the caterpillar killed, and the facts reported to the Department—the last in the interests of every grower in the State.—W. W. FROGGATT.

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* Messrs. Vinal and Caffrey describe this pest in Bulletin No. 19, Mass. Agric. Station.

The Pruning of the Vine.

H. E. LAFFER, Viticultural Expert.

PRUNING at the present day may be said to have been reduced to an art which entails certain manipulations of the growth of a plant with a view to securing an unnatural result in the development of the fruit and vegetative portions.

In a state of nature, the amount of growth and fruit produced is determined by climatic factors which regulate the amount of food supplied. This food is distributed over the full complement of buds, and when therefore the number of buds is large, there is insufficient energy to develop both wood and fruit to perfection. We find that trees and plants which are permitted to grow freely in their natural habit, become weaker as the years go by while their fruit becomes very small, woody in texture, and of little commercial value. The young wood is produced at the extremities of the branches and the lower portions of the old wood have a tendency to become bare and fruitless. By skilled pruning the number of buds is so limited that the individual growths may be vigorous. This implies that there will be ample energy in the vine to bring the fruit to commercial perfection, in addition to assuring suitable wood for the following year. In this way, not only is the crop assured for the time being, but provision is made from year to year for the general renewal of growth and maintenance of vigour.

Underlying all systems of pruning are certain principles which have their origin in a study of the laws which govern the growth and fruit-bearing characters of plants. As they vary in every species of plant, and even amongst individuals of the same species, a clear understanding of these principles will facilitate operations.

These laws may be summarised as below, and each will be found to be applicable in some measure to the pruning of all classes of plants.

1. "The vigour of growth of a plant or shoot, all things being equal, is in direct ratio to the number of its leaves." It will always be noted that a vigorous plant has an abundance of foliage during the growing season. The leaves act in the atmosphere in much the same manner as the roots do in the soil.

2. "The nearer a shoot approaches a vertical position the greater its vigour of vegetation."

3. "The vigour of a shoot, or portion of it, diminishes the nearer it approaches to a horizontal position." The two latter principles have special application to vines or trees trained upon trellis. Growths which are more or less vertical have a tendency to overpower those which are less advantageously placed.

4. " Deformations of any kind, such as those induced by wounds or compressions, reduce the vigour and activity of plants or those portions affected by them." This is illustrated by accidental ligatures or abnormal wounds or injuries.

5. " The smaller the number of buds upon a shoot or plant, the greater the vigour of each individual shoot growing from them." A vine spur of two buds develops stronger canes than a rod with a greater number upon it. This is a very important rule in pruning. It does not necessarily follow that a plant with but a limited number of shoots is strong, though the individual shoots are so.

6. " When a series of shoots of a healthy plant are placed on different levels, all things being equal, it is usually the topmost one which becomes the strongest." A casual examination of plants in general will serve to demonstrate this fact.

7. " When a portion of a vertical shoot is bent sharply at an angle, buds situated close below the bend will give rise to very strong shoots, while those beyond will suffer in proportion." A vine cane bent sharply and tied down to a wire will throw strong growths below the bend.

8. " In any plant or individual shoot of a plant, the number of flowers is in inverse ratio to its strength." That is to say, plants in a condition of excessive vigour have the tendency to produce but little fruit.

9. " The production of fruit is weakening to a plant for the reason that it draws the food away from the wood and stores it in the fruit, which is simply a means of reproduction." Thus we find that overproduction of fruit is weakening to the annual growth.

10. " The smaller the number of fruits, the greater their individual size." This must, of course, apply only within certain limits.

11. " The development of the fruits is inversely proportionate to the size of the shoot which bears them." This also has its limitations, for whereas very strong shoots fail to carry fruits of finest quality, on the other hand, too weak a shoot is incapable of nourishing it. Good average growth is the best fruit producer. The vine is a plant which remains productive over a long period, and pruning with a due regard to the application of these rules will serve to the maintenance of health, vigour and fruit-bearing over the greatest number of years.

Pruning involves something more than the indiscriminate removal of certain portions of the growth annually. In its highest sense, it should imply a knowledge of the functions of each portion of the vine, and such treatment of them as secures the desired result with a minimum of injury to the vine generally.

The skilled pruner takes in at a glance the whole structure of the vine, and quickly decides the course of treatment. He understands the habits of growth and fruit-bearing peculiar to the variety of vine he may be pruning, and manipulates its wood in such a manner as to ensure the balance between wood and fruit production. Definite systems of training vines have been evolved by the experience of generations, and the pruner, understanding the principles involved in each system, should ever have the perfect type in view. Although the attainment of the ideal may be somewhat difficult, it may safely be said that the nearer one can approach the type, the better the ultimate result.

In the interests of efficiency and economy, the pruner should strive to complete the whole operation with a minimum number of cuts, and to this end clean pruning is of great importance. Where a portion of the growth has to be cut away, it is no more difficult, nor does it take any longer, to completely remove the wood in such a way that the base buds will not remain. This is a point which is too frequently neglected, and more often than not, short stubs are left upon the vine, each one carrying several immature base buds. As a result of this practice, one or more growths of a spindly nature develop at these scars in the following season. Therefore the necessity of summer pruning arises, an operation which entails much time and labour, all of which might be saved by a little care in the first instance. Failing proper summer treatment, these growths develop at the expense of the fruiting wood, and moreover, have again to be removed at the following winter pruning. The vines become too dense in their growth, excluding light and encouraging disease; the fruit and the necessary wood are deprived of nourishment, the wood becomes weak in its nature, and if this point is constantly neglected, the whole vine ultimately becomes a dense mass of useless growths. In order to bring it back to a proper state, much work is required and frequently severe cutting is needed, to the detriment of the crop for the time being. The framework of the vine may be looked upon as a structure upon which a definite amount of fruit-bearing wood can be placed. Growths other than those needed for fruit production and renewal of the permanent wood, must be looked upon as an evil which unnecessarily saps the vigour of the general growth.

Objects of Pruning.

The art of pruning has three primary objects :—

1. To obtain fruit of uniformly good size and quality from year to year.
2. To maintain the vigour of the plant over a long period of years by balancing the production of fruit and wood.
3. To facilitate and economise in the cultural operations by restricting the spread of the trees or vines beyond the necessary limits.

In marketing fruit, size and quality count for everything. The consumer buys very largely through the eye, and therefore the fruit of good size and appearance is the one which sells best. Inferior fruit is difficult of sale even at the best of times.

In developing the maximum quality, good pruning plays a very important part, because it regulates the number of bunches which a vine is able to produce, and assures that, under normal conditions, each bunch will be brought to perfection. The maintenance of vigour is important, not only in so far as it affects the life of the vine, but also by the fact that it is reflected in the development of the fruit. The balancing of the vine, in order that the fruit shall not be secured at the expense of the growth, assures the renewal of the wood from year to year. It is only necessary to neglect the pruning of a vine for one year to see how quickly both wood and fruit deteriorate. One may secure a great number of bunches produced on innumerable weak growths, but they will suffer both in size and quality.

The question of facilitating cultivation is important for the reason that it permits of a greater proportion of the work being accomplished by horse-power, thereby reducing the amount of hand-labour needed. Cultivation becomes more economical where the compact nature of the trained vine permits of a freer use of horse-worked implements.

Structure of the Vine.

The vine is composed of the stem, main arms, secondary arms and annual shoots. This structure is illustrated in the accompanying Fig. 1.

The stem represents the permanent portion of the structure, and is the main channel of sap distribution between the root system and the other portions of the vine; in view of this, every care should be bestowed upon it. It should be trained with care, avoiding twists and deformations so far as possible, and so long as the vine exists, should be protected from injury. From time to time water shoots may be developed upon the stem, and they should be removed in such a manner as to avoid unnecessary exposure of the tissues and ultimate dry scars. Accumulations of dead wood are objectionable in so far that they lead to obstructions of the sap flow, and in addition are a source of trouble by their encouragement of dry rot and white ants.

The main arms are of but little less importance than the stem, and are practically permanent. Besides being the main subsidiary channels of sap flow, they perform the important function of supporting the secondary arms. According to the system of training applied to the vine, the main arms may number from one to three, and in rare cases more; in common with the stem they should receive every care. Where vines are trellised, the mistake is often made of twisting the main arms around the wires. Although this practice is permitted in the training stage, simply in order to secure straight arms, it is not advisable to allow them to remain so for more than one year. It is a simple matter to untwist at the end of the first year, by which time a sufficient degree of rigidity will have been secured to ensure straight lines. The objection to a permanent twisting is that the wire may eventually strangle the arm, and further that it becomes impossible to remove the wire if so desired.

The number of *secondary arms* is only limited by the strength of the vine. They support the fruit-bearing wood and, although not permanent in the same degree as the main arms, they should receive such treatment as will retain freedom of sap flow. Secondary arms tend to become elongated in the course of time, for the reason that each year adds a small portion to their length from the base of the old spur. Careful pruning serves to prevent undue lengthening, while at the same time the avoidance of unnecessary injury will serve to maintain their vigour by eliminating dead wood. No matter how much care may be taken, it is but a question of time when the arms become unduly long or lose vigour through the accumulated scars checking the flow of sap. One of the objects attainable by systematic pruning is the periodical renewal of these long or worn-out arms.

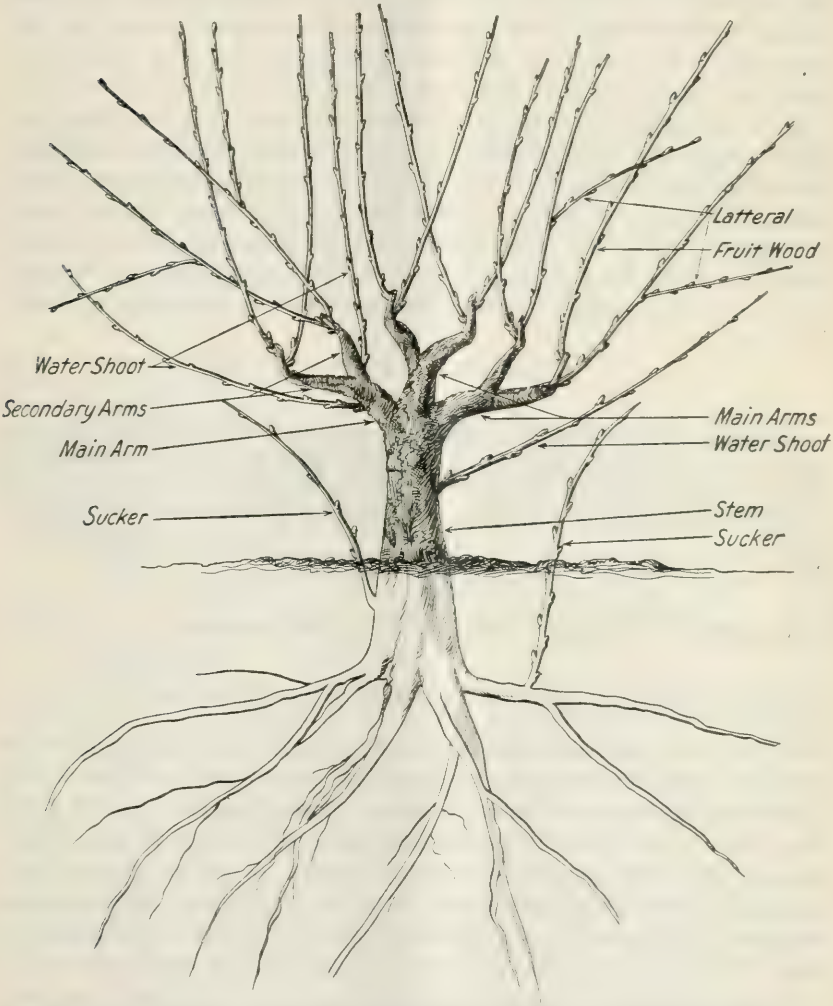

Fig. 1.—Diagrammatic representation of a vine illustrating its various parts and the several types of annual growth.

Annual shoots are the growths put forth from the more permanent structure and, for the purpose of description, may be subdivided into fruit-bearing wood, water shoots, and suckers.

Fruit-bearing canes arise from the previous year's spurs or rods, and as a rule, have behind them two consecutive years' wood. Such canes carry buds which in the following season will develop fresh canes that are fruit-bearing in their nature. This fruit-bearing wood serves to build up the framework of the vine, and therefore, apart from other considerations, it should be maintained in a vigorous condition.

Water shoots are strong canes developed from some portion of the vine other than the one-year-old wood. They have their origin in latent buds which, failing to break in their normal period, become embodied in the tissues of the older wood. Thus they may arise from any portion of the stem, main or secondary arms. For some reason—such, for instance, as a sudden and excessive sap flow due to rain or irrigation, to some check of the sap in worn-out arms, or by reason of very hard pruning—they break into active growth. Thus, in a sense, they represent safety valves on the vine, affording an outlet for vigour which the normal complement of buds is unable to absorb. In moderate numbers, they indicate a reserve of energy and that the vine is not being taxed to its utmost; in excess, they indicate too hard pruning, or else that portions of the vine require to be renewed. Water shoots have their uses in developing additional secondary arms, and in renewing injured or worn-out ones. They should not be confused with the growths developing from scars where canes have been imperfectly removed in the previous year.

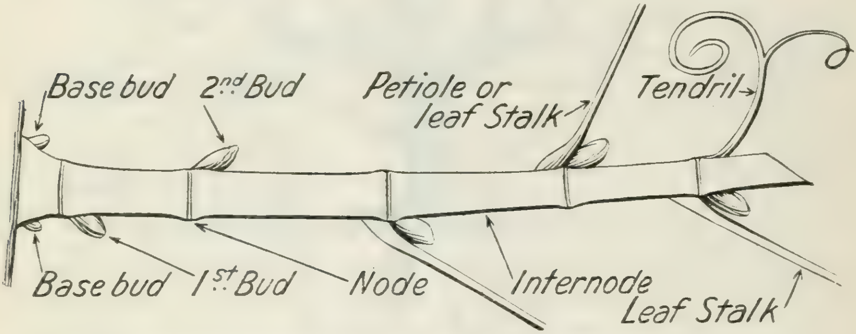

Fig. 2.—Diagrammatic representation of portion of a vine cane, showing external structure.

The term "sucker" is applied generally to shoots which arise from a portion of the stem below the soil surface. In the strictest sense, suckers are growths arising directly from the root systems, but in the case of the vine, this rarely occurs. The so-called suckers are more in the nature of water-shoots arising from the stem below the ground. Under general circumstances, they may be said to have no use, but cases do occur when it is possible to renew the old stem by training a sucker to take its place. Unless this is desired, the growth should be removed in such a way that no base buds are left for its renewal in the following season. The simplest and best plan is to uncover the base, and completely split or cut the growth away from the stem.

Strong annual shoots throw out from various points upon their length more or less vigorous growths which are known as "laterals." The normal bud is preserved at their base. In certain of the rod-pruned varieties, they at times have their uses as a means of increased fruit production.

Structure of the Vine Cane.

The annual wood of the vine differs somewhat from that of most other commercial fruit-bearing plants. A reference to Fig. 2 will serve to show that it is composed of sections defined by a slight enlargment of the diameter at the points where the buds are situated. These are termed "nodes," while the sections between any two are known as "internodes." The buds are prominent and are situated alternately in the angles made by the leaf stalks; the tendrils are developed opposite to the buds.

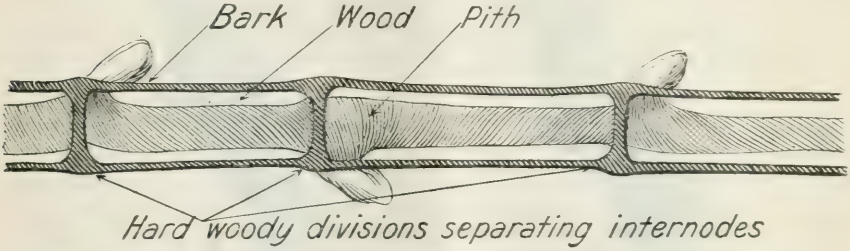

Fig. 3.—Diagrammatic representation of a portion of a vine cane, showing internal structure.

As a rule, the internodes become shorter and stouter the nearer they are situated to the base of the cane, and finally, two more or less immature buds are found close down to the insertion of the shoot. These are known as "base buds," and are not, as a rule, taken into account when the vine is being pruned. They serve as an additional outlet for growth should the first and second buds of the spur fail for any reason.

The internal structure of a cane, is illustrated in Fig. 3. It will be observed that it differs from other wood by reason of the large mass of pith constituting the central core. Thus, it will be seen that the cane consists of an outer bark enclosing a section of fibrous woody tissue much in the nature of a tube. The core consists of an accumulation of loose spongy cells, technically known as "pith." The nature of this pith enables it to absorb and hold a considerable quantity of moisture in the winter season. Further, in the processes which constitute the ripening of the wood, the pith acts as a repository for quantities of those substances which serve as food elements to the plant. This reserve food supply is used during the early spring for the purpose of nourishing young growth in its first stages of development.

Separating each internode from its fellow is a hard woody septum or division which is marked externally by a distinct line around the cane just at the base of the bud. Internally, these divisions cut off the contact of the pith at each node. So far as the reserve food supply is concerned, the communication of each bud is with the internode above and not with that below, as might at first sight be supposed. In wet, cold countries, this hard division is used as a means of preventing decay in the pith with consequent injury to the bud below. The practice under such conditions is to leave a full internode above the top bud, protected on top by the hard, woody septum to prevent the entry of water and bacteria which might set up decay. (*See* Fig. 4A.) It is claimed that the usual practice of cutting a short distance above the bud, leads to considerable damage by frost and rain. Conditions in Australia do not as a rule necessitate the observation of this precaution although many vignerons adopt it on physiological grounds. The internode dries up as the season advances, and it has been contended that the presence of the dry portion at the summit entails additional work in its removal at the subsequent pruning. As a matter of fact, this contention does not hold good. The pruner, when re-establishing the spur, will naturally select the lowest suitable fruit cane, and consequently the dead stub falls off with the portion of the old spur severed. There are many arguments for and against this treatment of the spur, but it may be considered to have no special application to Australian conditions. Fig. 4B illustrates the common method of making the section a short distance above the bud.

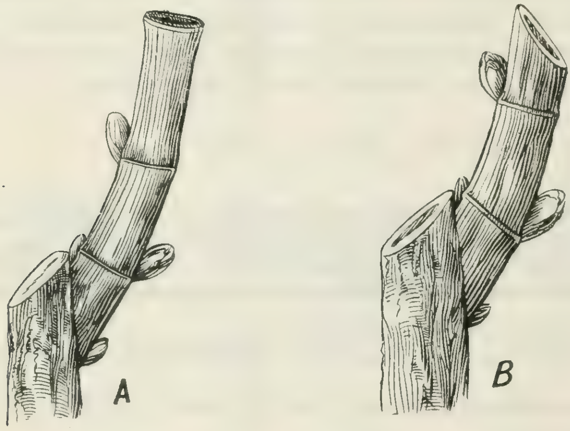

Fig. 4.—Diagrammatic representation of the method of making the vine spur.

A. Internode projecting above the bud.

B. Usual method, cut short above second bud.

(*To be continued.*)

"Bunchy Top" of Bananas in the Tweed River District.

G. P. DARNELL-SMITH, D.Sc., F.I.C., F.C.S., Biologist.

In accordance with a request from the Fruitgrowers' Association, I lately visited the Tweed River district, in company with Mr. Hopkins, to investigate the disease known as "Bunchy Top" in bananas. The plantations of a number of growers were visited and inspected, and I have to thank these gentlemen for help and hospitality, and especially to mention Mr. Stewart, Secretary of the Fruitgrowers' Association, who rendered much help. Numerous banana plants were dug up and examined, specimens were examined macroscopically and microscopically on the spot, and numerous specimens were preserved for further examination in the laboratory.

A detailed examination of these latter, subsequently made by Mr. C. O. Hamblin, B.Sc., B.Sc.Agr., Assistant Biologist, by means of several series of microscopical sections, failed to reveal either fungus or bacterial disease as the cause of Bunchy Top. In many diseased plants numerous eelworms (two species) were found in the roots, but in many diseased plants the eelworms were not present in great numbers, and in some apparently healthy plants eelworms were present. There is no evidence that eelworms exude a toxin hurtful to the whole plant, and in many cases they did not appear to be present in sufficient numbers to cause a disease. A review of the whole situation, after examining all the material at my disposal, leads me to the conclusion that Bunchy Top is not due to a fungus, to bacteria, or to eelworms. There remains the alternative conclusion that it is due to some physiological condition, to some unhealthy state of the plant brought about by adverse conditions of soil or climate, or by a "running out" of the stock.

In considering this aspect we may inquire, first, briefly, what are the conditions of growth in a healthy banana plant?

1. The fleshy roots extend several feet all round the corm, absorbing, by their root hairs, the necessary mineral constituents from the soil.
2. The leaves expand and in sunlight manufacture the necessary sugar and starch, at the expense of which, combined with the necessary mineral constituents, the whole plant including the corm, grows.
3. When the food supply derived from sources 1 and 2 is adequate, new tissue is continually formed, fresh leaves unfold, the small cap covering each of the young ones remaining intact until they are sufficiently developed to suffer no damage from rain; the false stem formed from the sheathing leaf stalks increases in size, and so does the corm. This latter at length sends up an apical growth, bearing a bunch of bananas, through the centre of the false stem (formed by the sheathing stalks of the leaves), and at the summit the banana bunch emerges, gradually becoming pendulous.

We may now consider the chief symptoms of Bunchy Top in plants affected by the disease.

1. As its name implies, the most characteristic feature of the disease is the tendency for the leaves to remain close together instead of expanding normally; hence such names as Bunchy Top or Cabbage Top.
2. The laminæ and stalks of the leaves are extremely brittle, and the laminæ of the leaves will frequently break sharply across if squeezed in the hand.
3. The cap protecting the young leaves falls off before they have properly developed. This results in secondary symptoms. Rain enters the leaf scroll, and the water remaining stagnant at the base, decay is set up in the centre of the stem. This may reach varying degrees, from little rust-coloured areas to the offensive putrefaction of the whole of the interior of the stem.
4. At the base of the upper leaf stalks in affected plants, parallel dark green lines are visible. These were first pointed out to me by Mr. Marks, junr. They seem to be invariably present. No organism has been found connected with these lines, and no marked alteration in internal structure. A number of the cells, however, have considerable deposits of gum in them. The dark lines are probably indicative of an unhealthy condition. In diseased plants a bunch of bananas is either not developed at all, or if it is, the bananas are small and puny, and the bunch often fails to assume the pendulous position. If the bunch does completely emerge and hang down, (*a*) the large bracts at the apex are often greenish-red instead of red and have a tendency to curl; (*b*) the bananas are black at their apices (anthracnose).
5. The stems of young corms are often somewhat constricted near the apex, while the leaf laminæ are somewhat broad, in contrast to the stems of young corms on healthy plants, which taper gradually to the apex, while the leaf laminæ are somewhat ribbon-like.
6. The roots upon the corms of all diseased plants that were dug up were invariably found to be in an unhealthy condition. Instead of being several feet long, fleshy and turgid, their extremities were dead. Sometimes they were decayed over half their length; sometimes the decay extended as far as the corm, in which case the external coating of the corm was blackened. In some roots numerous eelworms were found, but sections through these roots at the point of junction of the healthy and unhealthy portions fail to demonstrate that the decay is entirely or in large part due to eelworms, bacteria or fungus disease.

The cause of Bunchy Top appears to be in the main due to this root decay, and the indications are that it has been brought about by adverse conditions, drought or flood, or drought followed by flood. I understand that in the Tweed River district there have been practically two droughts followed by floods in the last two seasons. There are two reasons why bananas should here show themselves particularly sensitive to adverse climatic conditions. (*a*) The banana is naturally a tropical plant, and in the Tweed River district it is growing practically at its southernmost limit. (*b*) The bananas in the district would naturally show a tendency to "run out," since bananas are not produced from seed and, so far as I could gather, all the corms in the various plantations can be traced back to one or two original plantations. I have been informed by growers that the Bunchy Top condition is occasionally found in Fiji and in the New Hebrides. As far as their observations went it was confined to plants whose roots had been affected by an excessive amount of water.

In one case I observed at Teranora the disease appeared to be directly connected with a water soakage and to be spreading in the direction of the water flow; in another case it appeared to be most prevalent in the dampest part of the orchard. On the other hand, a grower showed me a plant which had had Bunchy Top for years while no plants in the vicinity showed the disease; while at the plantation of another grower bananas had been grown for ten years or more and had only just begun to show Bunchy Top. These are only a few observations among a number that strengthen my view that Bunchy Top is in the main due to faulty root development or root decay, and is not a contagious disease. Roots upon corms growing upon three types of soil: (*a*) chocolate soil, old cane land, very deep; (*b*) virgin scrub land, chocolate soil not very deep; (*c*) soil intermediate in character between that found on typical scrub land and typical forest land, all showed dying at the tips, and decay more or less extensive, travelling from the apex towards the corm, and the plants from which they arose all showed Bunchy Top. On the other hand, roots from plants growing from healthy plants in a somewhat sandy soil near the sea where the rainfall was fairly regular showed no decay; they extended for several feet, and were fleshy and turgid.

We may conclude, therefore, that either the physical or chemical condition of the soil has contributed to the decay of the roots, or the atmospheric conditions to which it has been subjected. These latter we cannot control. A comparison may therefore be made of soil in which healthy banana plants are growing and of soil in which banana plants have developed Bunchy Top, with a view to applying remedial measures.

The Soil Conditions.

Three samples of soil were submitted to Mr. F. B. Guthrie, F.I.C., Chemist, for analysis—Nos. 1 and 2 from the neighbourhood of a plant that had developed Bunchy Top and No. 3 from a plantation in which no plants had developed Bunchy Top. The points upon which an expression of opinion was asked from Mr. Guthrie, and the answers received from him, were as follows:—

Question 1.—Is the physical condition of soils 1 and 2 sufficiently different from 3 to suggest that the sandy nature of the latter is responsible for the non-development of root-rot following water-logging?

Answer.—Soil No. 3 is very much more sandy than Nos. 1 and 2, which are almost pure clay. Its capillarity is higher and its water-holding power less, so that it is less likely to become water-logged and would more readily recover from such conditions than the others. At the same time it is curious that No. 3 is more acid in reaction, a state of things usually associated with accumulation of water. This soil would probably be readily sweetened by the addition of lime, whereas the other requires draining.

Question 2.—Is there much more salt in No. 3 than in Nos. 1 and 2? (These two samples were taken from the same spot at different depths.)

Answer.—Salt is absent in all cases.

Question 3.—Would lime be of benefit to the soil? If so, should calcium oxide or calcium carbonate be added? The soil does not appear to be rich in humus and is porous to a considerable depth.

Answer.—Lime would benefit in all cases. In the case of Nos. 1 and 2, freshly slaked stone lime should be used to break up the heavy clay, ½ ton per acre. In the case of No. 3, carbonate of lime or agricultural lime at the rate of 1 ton per acre will be more effective.

Question 4.—Are these soils, or Tweed River district soils in general, deficient in some constituent that could with advantage be supplied by an artificial fertiliser? As bananas are supposed to do better by the sea, some local growers suggest the application of salt.

Answer.—These soils are rich in nitrogen and lime, and rather poorly supplied with phosphates and potash. The soils from the Tweed River are on the whole rather above the average in plant food.

Question 5.—What general manure should be recommended for banana plantations in the Tweed River district? Soils on the Tweed River hillsides suitable for growing bananas are divided locally into "scrub land" and "forest land." The scrub land consist of deep, porous, chocolate-coloured soil, and, if very deep, appears to be capable of growing bananas for ten years or more. The forest land is of a much lighter colour, contains more clay, and the bananas do not appear to thrive on it for more than four years, neither do they on the chocolate soil if it is not deep.

Answer.—The mixture for bananas on these soils should be well supplied with potash and phosphates, in both of which the soils are rather lacking, and both of which, especially potash salts, are essential in banana growing. I should be inclined to attribute the abnormal growth observed (in the absence of any fungus or other disease) to the extreme stiffness of the soil, which hinders the free development of the root system and thus affects the growth of the plant. The remedy in this case would be to plough up well and subdrain and to apply plenty of freshly slaked lime. The application of salt might be tried as a experiment.*

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* The configuration of the land and the large number of surface boulders would, in the majority of cases, render ploughing or subdraining impossible.

The replies of the Chemist indicate in what direction aid from artificial fertilisation may be expected; below are the combinations of artificial fertilisers recommended by Mr. Guthrie.

4¼ cwt	Superphosphate	per acre.
1½ ,,	Sulphate of potash	
3 ,,	Dried blood (or) 2 cwt. Sulphate of ammonia.	

Different quantities of these proportions might be tried.

6¼ cwt.	Superphosphate	or	8½ cwt.	Superphosphate	per acre.
2¼ ,,	Sulphate of potash		3 ,,	Sulphate of potash	
4½ ,,	Dried blood		6 ,,	Dried blood	

These formulæ are affected by the failure of supplies of sulphate of potash, and it will be necessary, Mr. Guthrie adds, to apply the potash separately. Make up the mixture as to the other items, but apply the potash in the form of wood-ashes two or three weeks previously. Roughly, 13 or 14 cwt. of wood-ashes will be required for each 1 cwt. of sulphate of potash.

It is interesting to note that in reply to numerous inquiries among growers as to whether anyone had succeeded in arresting Bunchy Top, the only one who thought he had had some indications of success was Mr. Marks, junr. He had applied lime directly to the corms and around them with the view of neutralising an acid produced, as he thought, by worms. The production of the acid by worms may be doubted, but of the amelioration of the soil by the application of lime there can be no doubt.

The Treatment of the Plants.

We turn now to a consideration of what may be done to combat the disease by treatment of the plants themselves. Suckers should be taken for fresh plantations only from plants which are perfectly healthy and which have shown no signs of Bunchy Top. Whatever may be the cause of this disease, the tendency to form Bunchy Top may become hereditary. Our cauliflowers, which we prize to-day, are nothing less than botanical monstrosities, only in this case it has suited us to propagate the abnormal plants. A good banana sucker should have a firm corm, a tapering stem (without any sign of constriction), and ribbon-like leaves. In Jamaica the life of a banana plantation is reckoned at five years; in the Tweed River district they have lasted much longer, but there appears to be a tendency to grow too many stems on one clump. I may quote here from Fawcett's book on the banana. "There is no part of banana cultivation that needs as much individual attention, supervision and judgment, as the pruning. The retaining of wormy suckers may mean the loss of hundreds of pounds to the large cultivator. If the planter is fortunate in growing a fairly even field of plants, then all is plain sailing, as one size of follower* may be left throughout the field, but, otherwise, then each sucker must be treated on its own merits. I have observed more mistakes in pruning, entailing more or less loss to the owner, than I care to recollect; some from ignorance, but more often from greed. It is hardly possible to grow more than 450 stems per acre and get your followers *right.* Some persons try to get as many as 600 to 700. These speculators usually wind up by marketing not more than 200, and most of these in the bad months."

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* A "follower" is a sucker left at the root of the parent plant to produce the succeeding crop.

It is curious that Bunchy Top has been observed in sugar cane. In reply to inquiries, Mr. Ward, of the Botanic Gardens, informs me that something similar to Bunchy Top has been observed in cannas, and he thinks it would be possible to produce Bunchy Top by treating the parts of the plant below ground in an unsuitable manner. That Bunchy Top should occur in plants so widely separated botanically as the sugar cane and the banana, indicates that the disease is of physiological origin, for a fungus disease usually confines its attacks to plants that are closely related.

Different manners of treating stems from which a bunch of bananas had been removed were noted. Sometimes they were left, sometimes they were cut in half, sometimes they were cut near the base. I am of opinion that as soon as the foliage leaves have withered the old stems should be removed completely from the plant and left to rot at some distance from it, in order that water may not collect above the corm, and that the mucilaginous slime incidental to decay may not fall directly upon the parent stock.

In order that the banana industry in the Tweed River district be put on a better footing I would recommend :—

1. That fresh stock from a more tropical district be imported under suitable supervision to replace the present stock, which may be running out. The variety grown is almost exclusively that known as the Cavendish.
2. That a man versed in tropical agriculture travel the district to advise growers.
3. That a small banana plantation in the district be acquired by the Government for experimental purposes.
4. That the Tweed River Fruitgrowers' Association experiment on some plantation, not too old, which has shown indications of developing Bunchy Top, by applying such manurial dressings as have already been indicated, plots, say, of one-tenth acre being tried, leaving check plots at intervals.

TO COMBAT WIRE WEED.

REPLYING to a Muswellbrook correspondent who had discovered wire weed (sometimes known as hog weed) to be making serious inroads on his stand of young lucerne, the Agrostologist replied : Wire weed (*Polygonum aviculare*) is a bad weed in cultivated areas, but a good stand of lucerne has been proved to be able to hold its own against it in most localities. The crop should be disc-harrowed when firmly established (about six months after sowing), most of the wire weed being removed in this way. If the crop is mown before the weed sets its seed, it will be generally found that the lucerne has the upper hand next autumn.

The Black Banana Stem Weevil

(*Cosmopolites sordidus* Germ).

W. W. FROGGATT, F.L.S., Government Entomologist.

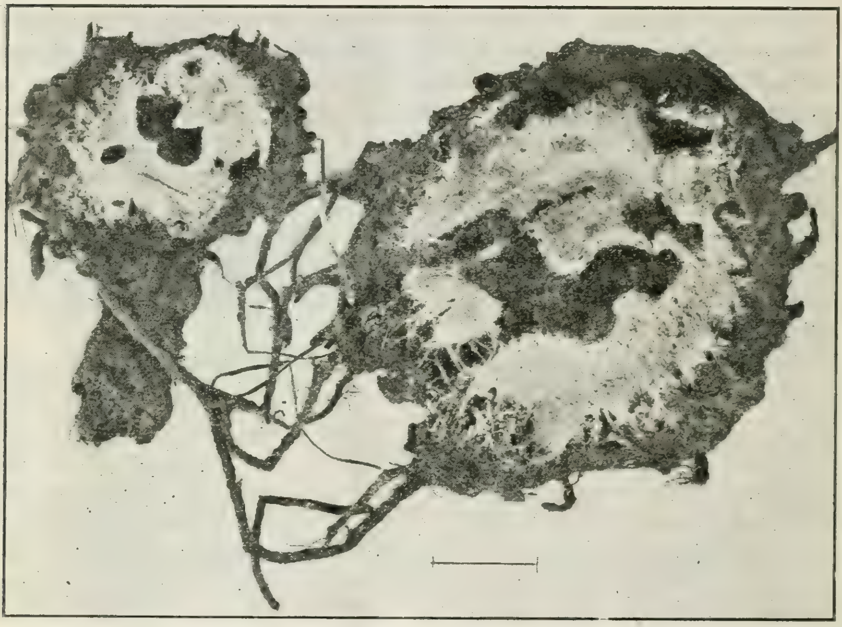
This beetle was originally described from Java, when it was included in the cosmopolitan genus *Sphenophorus*, a large group of typical weevils, principally confined to tropical countries, which, in the larval state, feed chiefly upon the stems of various palms, sugar-cane, papaia, and bananas.

The best-known pest of this genus is the sugar-cane borer (*Rhabidocnemis* (*Sphenophorus*) *obscurus* Boird). Originally recorded as a banana pest in Tahiti, it was accidentally introduced into the Hawaiian Islands at a very early date, where it turned its attention to the sugar-cane plantations. Later on it was conveyed in sugar-cane to Fiji, where it became even a more serious pest. Koebele, writing in 1894 on insect life, stated that it was estimated that 32 per cent. of the cane was infested when there was commenced a systematic method of trapping with sections of split sugar-cane on the ground. By this plan eleven and a half million beetles were collected and their ravages reduced to about 7 per cent.

The black banana weevil was first recorded on the Tweed from a banana plantation near Stoker's Siding. This has since been dug out, and there are now no bananas in the previously-infested area. The infested district at present appears to be the Condong Range, where there are a number of plantations more or less badly attacked. The extent of the infestation can only be ascertained by a careful inspection of all the banana patches over this area, but it is not unlikely that the weevils will be found in other districts in isolated patches. How they first reached Condong no one knows for certain, but there is little doubt they were introduced with young plants. These beetles had previously been recorded as a pest on the bananas at Redland Bay, Queensland, and before the authorities recognised it and quarantined the district large numbers of banana plants had been brought from there into the Tweed River district. Though furnished with well-developed wings beneath the wing covers, this beetle does not fly much, and by flight does not extend its range very far beyond an infested plantation, so that in nearly all cases the beetles or their larvæ are brought into clean plantations by infested suckers.

Life History and Description.

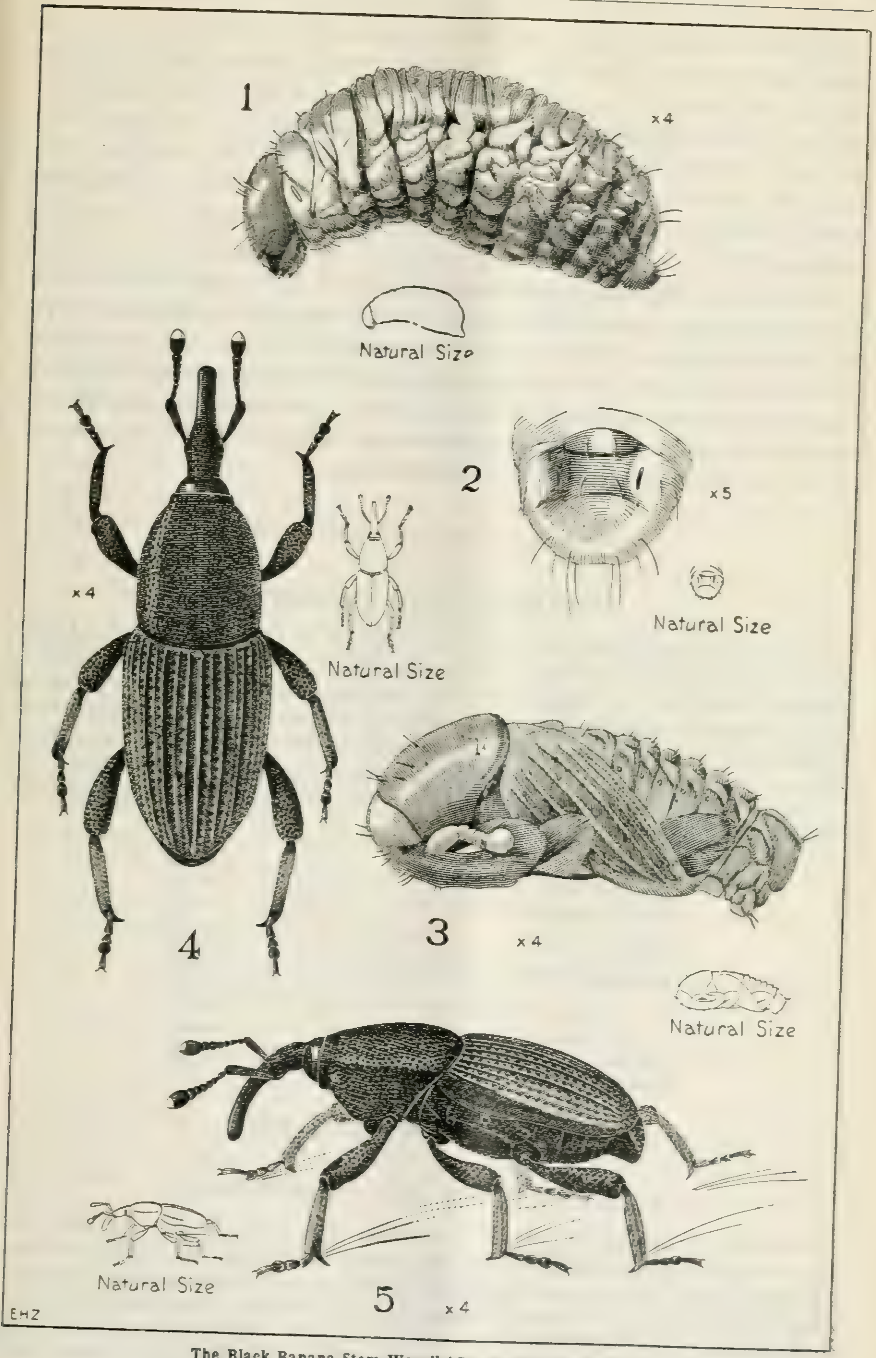
The eggs are deposited by the beetle on the tissue of the banana stem just above the ground, the resultant larvae burrowing downwards, as they feed and grow, into the base of the stem, packing the tunnels they excavate with the gnawed tissue behind them. The first noticeable damage are these rounded bores running through the healthy, solid white tissue. Later on, if the larvæ are numerous, the whole of the basal portion of the stem becomes a spongy or felted mass of tissue, when the plant dies out. When full grown the larva changes into a chrysalid in the end of one of the burrows. Many of this group of beetles form regular oval cocoons of the gnawed fibre, but the writer did not find any traces of the pupal stage when investigating their work among the infested plants,though full-grown larvæ and the perfect beetles were found in numbers in the last week in September. A few weeks later we received from a correspondent a bottle full of specimens, containing the larvæ, pupæ, and perfect beetles from the same locality



The Effects of the Attacks of the Black Banana Stem Weevil.

The larva is a short, thick-set, wrinkled, legless white grub, with a rounded reddish-brown head turned down in front. The thoracic segments are constricted, and form a neck between it and the swollen abdominal segments, which swell out in the centre, and are contracted at the anal extremity. The anal segment has a depression above and a pair of elongate oval spiracles, with scattered stiff hairs below. Its length is slightly over half an inch.

The pupa is dull white, showing the outlines of the beetle, with the immature wings folded over on the sides and the snout turned down in front of the head. It has two rows of short tubercules on the head and snout, and a row of rounded spiracles on the sides of the abdomen and the anal segment, with a stout yellowish spine on either side, and a smaller one on either side of the preceding segment. Its length is half an inch.



The Black Banana Stem Weevil (*Cosmopolites sordidus*).

1. Larva of Black Banana Stem Weevil.
2. Upper view of anal segment.
3. Pupa.
4. Dorsal view of beetle.
5. Side view of beetle.

The beetle is of a uniform dull black tint, thickly covered (except on the dorsal surface of the thorax and wing covers) with a fine greyish buff pubescence. The whole of the thorax, head, rostrum (except the lower portion), legs and under-surface are thickly and finely punctured. The wing covers are finely impressed with parallel lines forming regular bars, between which they bear fine punctures. The bottom of the furrowed lines are also punctured, but more coarsely, particularly on the outer margins. Its length is half an inch.

This is one of the beetle pests which, though at present not widely distributed or increasing very rapidly, might at any time alter its habits and, like the allied sugar-cane weevil, become a very serious banana pest. Every banana grower who finds on his plantation anything like the beetle illustrated on the accompanying plate, should therefore report it to the Agricultural Department and send specimens without any delay, so that advice can be given how to isolate and treat any infested area.

OF USE IN THE PIGGERY.

A TREE that seems likely to be a useful adjunct in the piggery is the honey locust (*Gleditsia triacanthos*). It is a deciduous tree, with beans that are readily eaten by the pigs, and one that was planted at the piggery at Hawkesbury Agricultural College promises to answer the three-fold purpose of giving shade, shelter and food. The deciduous nature of the tree also gives the sun an opportunity of sweetening the soil during the winter months.

The following analysis of the beans has been supplied by Mr. A. L. Musso, Chemist's Branch:—

Moisture	7·66
Albuminoids	13·22
Ether extract	1·76
Ash	4·20
Fibre	17·03
Carbohydrates	56·13
	100·00
Albuminoid ratio	1 to 4·5
Nutritive value	73·3

A CHEAP PAINT FOR PRUNING-CUTS.

REPLYING to a correspondent who inquired if coal tar might be used to put on cuts when pruning fruit trees as a cheap substitute for paint, the Fruit Expert wrote:—I have not used coal tar for painting cuts on fruit trees to any great extent, as I found during the cold weather it was too difficult to spread thinly, and when the hot weather came the thick coating of tar was liable to melt and run down the bark and scald it. Dry red oxide mixed with paint oil is the cheapest form of paint, I think; a little goes a long way.

Lucerne (Alfalfa) Meal.

THE possibility of lucerne meal being used in the feeding of cattle, pigs and poultry is often the subject of inquiry, but the product, as it is known in New South Wales, varies so much in its value as a food that the Department took advantage of the recent visit of Mr. E. Harris to North America to collect information about it there. "Alfalfa meal" is so often referred to in American publications that it might reasonably be thought that it had become a standardised article there, and that it had acquired a recognised feeding quality. The facts, however, are quite otherwise. The meal is made from lucerne hay of all kinds, and a very considerable quantity of it seems to have been milled from poor, stalky, inferior hay that would bring but an indifferent price if sold in any other form than as "meal."

The inquiries made by Mr. Harris elicited the fact that the meal is but a minor commodity in Canada. In the United States, however, it is more extensively used. In California about 50,000 tons of alfalfa meal is made annually, and in the Middle West about 500,000 tons. The Californian meal is sold locally, being used equally by the dairying and poultry industries. Prior to the war, quantities of that made in the Middle West had been exported to the Atlantic coast and also to Europe. In California the meal is milled from loose hay when it is brittle dry, but further east a large proportion is "shredded" from loose hay, and also from "baled" hay. The general opinion of American dealers seemed to be that when the hay could be obtained it was preferable. The advantages of the meal were said to be the avoidance of loss of the small leaves, and considerable saving in freight charges when the material had to be sent any distance.

Samples were obtained of the meal that was on the San Francisco market at the time, one representing a medium meal used for poultry and pigs, a second "shredded alfalfa," and a third a mixed feed consisting of 65 per cent. of alfalfa meal and 35 per cent. of sugar beet molasses.

As already stated, the product is far from having a recognised or standardised feeding value, and it was with difficulty that information could be obtained as to its actual value in this respect. One or two references in publications of recognised status offer clear confirmation of the impression gathered.

In "Feeds and Feeding," Henry and Morrison write :—

> Alfalfa meal varies in fineness from a product nearly as fine as cornmeal to a coarsely chopped or shredded material, containing pieces ½ inch in length. . . . Unfortunately, it is impossible to determine without chemical or microscopic analysis whether alfalfa meal has been made from nutritious, leafy, early-cut hay or from over-ripe stemmy material. Hence the meal should be purchased on guarantee of composition, special attention being paid to the fibre content, which in first-class meal should not be higher

than in good quality hay, or about 30 per cent. . . . In view of the fact that the market price of alfalfa meal is often as high or higher than that of wheat bran, it is important to note that trials at each of three stations substituting good quality alfalfa meal for an equal weight of bran lessened the product of dairy cows.

"Farmers' Bulletin," No. 384 (1910), of the United States Department of Agriculture, says :—

> Though sometimes sold for the market just as it is ground, it is more commonly mixed with molasses, corn chop, wheat screenings, chaff, weed seeds, or other waste products. . . . . The value of alfalfa meal has been widely advertised, and many expensive plants have been installed for the purpose of grinding alfalfa hay to meal. This is an expensive operation, and it is doubtful whether the benefit derived from it justifies the purchaser in paying the increased price of the ground material. . . . . Grinding adds comparatively little to the digestibility of the feed for healthy animals. It may even tend to detract from it. . . . At the Vermont station an alfalfa-meal ration made less milk and butter, carried less fertilising value, and was fed at a loss as compared with a wheat-bran ration, the meal costing twenty-seven dollars and the wheat-bran eighteen and a half dollars. Had each cost alike, the former would still have been outclassed.

The samples of meal referred to above were shown to Mr. J. Hadlington, Poultry Expert, who at various times has warned poultry-keepers of the great variability of so-called lucerne meal, and of the fact that many samples consist of little else than woody fibre, having been milled from inferior, stalky, lucerne hay. Mr. Hadlington wrote :—

> Of the three samples, I should class two as not only worthless, but probably most injurious to poultry. The third sample is of a better class, but still below the quality desirable. I am of opinion that, owing to the fibrous content of the best sample, it would be unwise to feed more than 10 per cent. of it in the morning mash. . . . There is abundance of this same class, and worse, available in this State at the present time, and many are using it and paying £10 to £12 per ton for it. From my knowledge of the subject, I consider it worth less than £5 per ton as a poultry food, though even then the limitations as to the quantity to be used must be kept in mind. There appear to be large quantities of a poor class of alfalfa hay now being shredded by machinery in this and adjoining States, and samples are constantly being brought under my notice by produce firms, with a view to inducing the sale of it to poultry farmers.

The following sentence appeared in the "Poultry Notes" in August, 1918 :—

> Many of the supplies of so-called lucerne dust contain much dead material and are little else than machine-crushed lucerne stalk, in which the fibre content is very great.

SAFE STORAGE OF OATS.

OATS are not readily attacked by weevils, but these pests do at times cause damage. It cannot therefore be said that oats can be safely kept over a number of years.

In effect, that was the reply of the Chief Inspector of Agriculture to a Holbrook farmer who contemplated storing oats in an iron shed with a wooden floor, in the hope that they would keep for years as a fodder reserve. In such conditions, in fact, weevils seem to breed rapidly. There should be no difficulty, however, about keeping the grain for say a year or so. When sheds are emptied and cleaned up thoroughly year by year weevils are kept in check, but otherwise they multiply freely.

The Artificial Increase of the Colony.

W. A. GOODACRE, Senior Apiary Inspector.

To be able to increase the number of colonies by artificial methods is of considerable assistance to the competent apiarist, but beginners are often anxious to carry out the work without giving sufficient consideration to the particular conditions under which this method of increase is made practicable and beneficial. The beginner is advised first to attend to the colonies on hand, using every endeavour to make them as populous as possible; then, after making a close study of the conditions essential to the system, artificial increase may be tried in a small way.

These conditions may be set out as follows:—(1) The colonies should be populous, and in a progressive state in relation to brood-raising; (2) the weather should be fine and warm; (3) the increase should be made early in the season—preferably during the late spring; and (4) there should be indication of a fair provision in the way of flora for the prospective young colonies. It must be remembered, too, that the highest production is gained with moderate increase. When moderate increase is desired, the principle of dividing the colonies is usually preferred; moderate or extensive increase can be made, however, by forming "nuclei."

Forming Nuclei for Increase.

The foregoing conditions having been fulfilled it is next necessary to prepare a number of hives or nuclei, to contain four or five frames; the latter to contain full sheets of comb foundation. In the case of a beginner it is advisable to purchase the required number of untested Italian queen bees. The procedure is then as follows:—

First fit a piece of wire cloth across the entrance, pressing the cloth well into it before fastening in order that the bees shall not be jammed in their efforts to get out. Take three or four of the prepared hives to the colony to be manipulated, find and cage the queen, remove one frame from against the wall of the body containing the brood nest, and space the remaining frames, thus allowing extra room for the bees to cluster on the frames to be removed later; put the cover on the portion of the hive containing the brood nest and shake the majority of the bees from any supers as near to the entrance as possible, only a little smoke being necessary to hurry most of them into the hive. Give each nucleus two frames of brood and bees, one frame of honey, and one empty comb or full sheet of foundation. The foundation or empty comb should be against the wall of the hive; then the brood, and the frame of honey to act as a follower. If the queen bees are at hand, they can now be put in according to the directions on the label of the package containing them. If the cage will fit on the top of the frames screen downward all the better; if not, it should be between the frames, and the latter pressed up, care being taken to allow some communication through the screen. The cover can be put on immediately after each nucleus has been given to the bees, brood, &c. For extra ventilation put underneath the cover a thin wedge.

Should a hive contain nine frames of brood, then four nuclei may be made, and one frame left with the parent colony; the queen could then be liberated on this frame, and the full complement of frames, containing full sheets of foundation or good breeding combs, put in the hive. The supers should be placed above an excluder. The nuclei can be placed on stands in the yard, providing they are sheltered from the hot sun, though some apiarists prefer to put them in a room during the time the bees are shut in. They are kept closed for three days to allow the bees to become accustomed to their new home; if they are removed to an out-apiary the entrance screen may be removed in about three-quarters of an hour after being put on the stands providing that a few puffs of smoke are delivered at the entrance to prevent a rush on its removal. In this case, when bees are to be removed it is advisable to introduce the queen after the bees settle down—generally a matter of a few hours.

If it is not desired to purchase the queens, it will be necessary to have ripe queen cells on hand to put in after the third day. If making moderate increase by forming nuclei, the apiarist should take one nucleus from each selected colony. In this case it is unnecessary to put an excluder over the brood nest.

Another Method of Increase Dividing.

Another method, similar to that known as the Alexander plan of increase, is as follows:—

Prepare one hive body for each nucleus colony to be divided, each containing frames with full sheets of comb foundation, which are interchangeable with the frames, &c., contained in the brood nest. A queen excluder is necessary for each colony.

The first work in dividing is to find and cage the queen. Next, exchange a frame of brood and bees for a frame of comb foundation from the new hive body, making sure there are no queen cells on this frame of brood. Remove the old hive from its bottom board, and put on the prepared hive body, now containing the frame of brood and bees; the queen can then be liberated on this frame. The excluder may now be put on, and the remainder of the colony put over it; should there be any queen cells above the excluder they should be removed. In five days the colony should be examined again and if any queen cells are started above the excluder the old colony should be removed later in the day and the entrance blocked with grass. Do not disturb the colony for two or three days, after which the cells can be destroyed, and the colony will accept a laying queen or ripe selected cell.

If no cells are started above the excluder the colony may remain for another five days; this will give the queen a chance to have a fair start below and the brood above the excluder will all be sealed. The old colony can then be removed to a new stand, and after twenty-four hours will accept a ripe selected cell or laying queen. It is advisable to introduce a laying queen to prevent delay in brood raising.

Nuclei can be formed from the old colony above the excluder if extensive increase is desired, but it would be advisable to crowd the bees into the two bodies containing brood above and below the excluder. This is done by shaking the bees from any surplus supers apart from the brood chambers and allowing them to settle down before forming the nuclei.

VINEYARD NOTES FOR NOVEMBER.

THE soil in the vineyard should be kept loose and free from weeds, with the object of conserving moisture. Disbudding of useless growths should be continued, throwing all the energy of the vine into the fruit and the necessary shoots. Apart from other considerations, disbudding facilitates pruning in the succeeding year. Amongst table grapes, the reduction of the bunches in order to secure size and quality should be attended to. Where too heavy a crop is permitted, more particularly if the vines are planted close together, there may be a difficulty in getting the fruit well coloured.

Interfere with the foliage as little as is consistent with efficient working. Remember that the leaves have to mature the fruit and their removal will adversely affect this important function.

Keep a close watch for disease. Rising temperatures and possibly humid conditions create a dangerous period for all classes of fungoid pests. In all localities which are known to be subject to any of these diseases, remedies should be applied without waiting for the actual appearance of the trouble.

In some instances caterpillars have been observed in their early stage. Arsenate of lead at the rate of 1 lb. to 10 gallons of water will kill them if sprayed upon the leaves.—H. E. LAFFER, Viticultural Expert.

A FARMER'S TESTIMONY.

"I HAVE much pleasure in thanking you for having so kindly sent to me up to date the *Agricultural Gazette.* I have derived much information and pleasure from reading it. It is a sure guide for farming and all that is required for the man on the land. Many a time it has been a great teacher to me."

IN the forefront of the measures that should be taken to link together practical agriculture and science should be placed the recruitment of the best scientific talent that the country can provide.—*Nature.*

Poultry Notes.

NOVEMBER.

JAMES HADLINGTON, Poultry Expert.

WE can now look back over the past hatching season and make comparisons with previous years. Such comparisons appear to be favourable to the season just closed, and on well conducted and equipped farms the rearing also appears to have been on the whole good. At the same time, it is evident that there are many farms where experience is being dearly bought. The development obtained in the young stock is much behind what it should be, the losses among the chickens are abnormal, and the cost of feeding is being unduly increased by feeding on lines that cannot be endorsed. Many such farms must inevitably come under the category of "non-paying concerns."

Economic Aspects.

Quite a number of things have occurred during the past month calculated to agitate the minds of poultry farmers and to cause disquiet as to the prospects of the industry.

The drought has continued to imperil the chances of securing even a small wheat crop, while the consumption of pollard and bran by stock other than poultry is increasing, and has already had the effect of still further increasing the cost of feeding our birds. In addition, there has been the rumour of price-fixing for eggs, and an application by a large body of consumers for an export duty on eggs. Neither of the latter, as matters of common-sense, could possibly have any chance of success, seeing that poultry farm millionaires or profiteers simply do not exist. This was at once seen by the Commissioners, and poultry farmers were exempted from the operations of the price fixing statute. No further apprehension, therefore, need be felt on that score.

Export of Eggs.

The one ray of hope to the poultry keeper has been the fact that a small export trade has developed which has had, at any rate temporarily, the effect of putting the prices received for fresh eggs during the cheap period 4d. to 6d. per dozen over those usually current at this time of the year. The effect of this will be that for probably two-thirds of the entire year's output we shall receive in the vicinity of 4d. per dozen above the prices current in previous years. This 4d. per dozen, on the basis of twelve dozen as a fair flock average, means or should mean an increase in the return per hen of 2s. 8d. on the year. If this estimate is realised it will be rather more than a set-off to the increased cost of feeding up to the present.

The Outlook.

What further troubles may be in store cannot, of course, be predicted. Those who have followed what was published in these notes in August, will again observe that in one way or another the cost of production is still followed by higher values received for our products. And the more poultry farming throughout the world is brought under commercial conditions, the more surely will this law of supply and demand operate. What has caused this demand for export but the operation of the same law? It is evident that the cost of production in other countries has increased in like manner to our own, hence eggs have commanded higher rates even when exported; let it be remembered that some trade in export of eggs had already set in prior to the war.

The next question is, "Will this demand continue?" Time alone will bring an answer to this question. But when we remember that our seasons are the reverse of those in America, and that consequently our cheap season is their dear one, and that so far the limits to export from here (with the exception of three of the years of war) have been our inability to produce eggs in sufficient quantities, the outlook is perhaps somewhat assuring. At any rate it is questionable if the price of eggs will ever again fall to pre-war rates; certainly, without a corresponding cheapening of food they will not do so permanently.

A Warning.

However, notwithstanding what I have said above, the high cost of feeding will most assuredly go far towards the more speedy crushing out of the unprofitable farm. Every hen that is a non-paying unit will be a greater burden than ever on the whole flock, and her elimination will therefore be more essential than ever. The law of the survival of the fittest will operate more acutely under a high, than a low cost of feeding, as will also the general efficiency of the plant and the skill and aptitude with which it is run. Hence the farmer with little or no experience and a poor class of plant, will feel the full burden of his deficiencies. Sympathy with the farmer who is thus situated one cannot withhold, but let him remember that being forewarned he may be forearmed. There are, moreover, poultry-farmers who have the wherewithal to put in a good plant, and others who, perhaps, have good plant and who are not benefiting by the advice given by the Department, but who treat this advice as if it came from some theorist who had not put his theories to the test. Such farmers would do well to visit Hawkesbury Agricultural College during the next three or four months, and see for themselves the development secured there. They will find it instructive to compare the costs and method of feeding, &c., and the development secured with those of their own stock of the same age.

Basis of Production.

In citing as a basis a flock average of twelve dozen per hen, I am not soaring into the realms of high-laying capacity. With good management, a small amount of culling, and proper feeding, the ordinary flock of, say, White Leghorns, Orpingtons, Langshans or Wyandottes should be able to put up an average of twelve dozen per hen per annum, and even now with the high cost of feeding poultry-farming will pay on this basis. The average price over the whole of last year was 1s. 5½d. per dozen for new-laid eggs. This year it will be found to be much higher, and probably higher in proportion to the cost of feeding. These statements of the case may be unpopular in some quarters, but they are the truth; and if our farms are not paying, and we endeavour to get to the source of the trouble, we will find that it is not high cost of feeding and low prices for eggs, but something in our methods or management that is to blame. This truth will be borne out by many who are making poultry-farming pay, and who are yearly making additions to their plant and increasing their stock.

No El Dorado.

I am not contending that poultry-farming is an El Dorado. Long hours and close application to work is the lot of even the most successful, but this is usually understood when one goes into the business.

Many of our most successful poultry-farmers started with very little and have worked their way up to comparative comfort. The point, however, is that a person starting poultry-farming for a living in that way will, by the time he has reached the point of making a living, have accumulated an asset of from £1,000 to £1,500 in stock and plant. Is it any wonder that the person who starts out with very little capital has to struggle for a few years to reach the point indicated, and that many fail? The remarkable thing is, that while plant, equipment and stock are being got together (really the stock-in-trade), the farmer is looked upon as being engaged in a business that is not paying; there is a failure, in others words, to realise that what is going into plant and stock cannot go into a banking account, and that during that period there is little, if anything, for luxuries.

So long as we encourage the idea that poultry-farming is a non-paying pursuit, so long will our industry be at a disadvantage, because it is not commanding the respect and confidence that it should. Does the poultry-farmer find it difficult to secure a loan or an overdraft? If so, it is due not to the unsoundness of our business when properly run, but to the habit of its detractors who have failed to make good, or who have not fully appreciated the facts set out in this article.

A Recipe for Soft Soap.

The following is recommended by the Chemist as a recipe for soft soap:—

Melt together 8 parts of lard and 2 parts coconut-oil; then mix well with 10 parts caustic potash (potash lye) of 20 degrees Baumé and boil. When thickened, add another 8 parts of potash lye. Keep well stirred and boiled, and proceed in the usual way for soap-making.

Orchard Notes.

NOVEMBER.

W. J. ALLEN and W. LE G. BRERETON.

Cultivation.

THIS is one of the most important operations at this time of the year, especially in a dry season such as this, when all the moisture possible should be conserved for the trees. After each rain or irrigation the orchard should receive a thorough cultivation as soon as it has dried enough to be in good working condition: the work should be pushed through as quickly as possible so that the last part to receive attention shall not have caked and dried out to any great extent. The part of the land near the butts of the trees that cannot be reached with horse implements should be worked up with either flat or forked hoes.

The young trees will require further attention, and necessary strong shoots that are outstripping their neighbours must be checked, so that an even development is attained. Brush out any strong growths that are coming where not required and from which there is a danger of the necessary shoots being sapped or robbed.

In bearing trees that are making heavy growth of leaders and rendering the tree too dense, some of the leaders that are not required for the future forming of the trees can be cut out. In these, as well as the younger trees, however, it is always well to leave more than will actually be required at the winter pruning, as if taken out too drastically there is danger of losing, through wind or other causes, some that are left.

Thinning Fruit.

This operation can be carried out as each kind has completed its final natural shedding. With both pome and stone fruits there is one shedding just after setting, and a second one a few weeks later, after the fruit has swollen a fair amount. Thus, if thinning is done before this second shedding has taken place one may very easily overdo it, and find the crop too thin.

When thinning leave the largest, best formed fruit and eliminate the malformed or blemished. With apples and pears pinch the fruit out, only leaving part of the stalk. This will fall out later, but if taken out with the fruit many of the remaining fruit in the cluster will fall.

Pruning and Grafting.

Pruning of citrus trees can be continued, and passion vines can be topped back where it is desired to force out a second growth for a late crop.

Grafts that were put in this season and dormant buds of last season will require careful attention. Shoots coming from the stock should be rubbed off to prevent them robbing the shoots from the scions. With top-worked old trees it is as well to leave some shoots from the old variety along the stumps of the old branches below the scions to render shade till a new head is formed, but such shoots should be checked to prevent them robbing the scions. As the shoots from the scion extend they should be supported by tying, as they are tender and easily blown out. Some of the grafts are subject to attacks of fungus, which become noticeable by the blackening of the tips and leaves. To counteract this, Bordeaux mixture should be used at summer strength. Several applications are often necessary.

Diseases and Pests.

The dry season will not be favourable to fungus diseases; careful watch should be kept, but if dry conditions continue to prevail the later applications of fungicides can be dispensed with. Insect pests, however, are often more prevalent in dry seasons. The sprayings for codlin moth must be adhered to, and all infected fruit regularly collected and destroyed by boiling. Where moth is liable to be bad, and it is at all practicable to do so, the trees should be carefully gone through and all the young fruit into which the grubs have entered removed and boiled or burnt. If this is done before the grubs from the early brood have time to get through and leave the fruit. it is wonderful how the later brood will be reduced.

Care should also be taken to block fresh infection from outside sources. Cases returned from the markets are a serious menace in this respect, and should at least be carefully examined and any grubs sheltering in them destroyed. A more thorough plan would be to dip all returned cases at once in boiling water.

DESTRUCTION OF BUGS BY FUMIGATION.

To destroy bugs by fumigating with hydrocyanic gas, the quantities of the necessary ingredients with which the Department has found it satisfactory to work for every 1,000 cubic feet are 1 lb. cyanide, 1 lb. (liquid measure) sulphuric acid, and 48 oz. water. The usual formula in a smaller space—such as an air-tight room—is 1-1-3 in ounces.

The water must be measured into the tin or jar and the cyanide weighed, put into a paper bag, and placed *beside* the tin; then the acid is measured and poured into the water. *Do not add the water to the acid.* When everything is ready, the operator should drop the bag of cyanide into the blended water and acid, and go as quickly as possible from the room—and lock it.

The gas is poisonous and very dangerous. Without previous experience it should only be used under expert supervision—preferably with the assistance of a competent chemist.—W. W. FROGGATT.

THE application of the scientific method to technical problems may well be as potent an element in progress as the adoption of the results of scientific research properly so-called. The field experiment in agriculture may not be research, but it is futile as an *experiment* unless it is conducted under the conditions and interpreted with the precautions which science dictates.—*Nature.*

Agricultural Bureau of New South Wales.

Suggested Subjects for Bureau Meetings.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion :—

What do you consider is the best time to leave off cultivating maize—when knee high or at the beginning of tasselling? Which gives most satisfactory results—hilling or flat cultivation—and what implement do you prefer for the operation?

What methods do you adopt of keeping cream cool while it is awaiting transport to the factory? Do you keep it covered, and how: and do you find it any advantage to stir it from time to time? If you are not getting a high grading, what is the reason?

Do you mulch the young trees in the orchard that have been planted as refills? What do you prefer as the mulch for this purpose—loose soil or a coating of decomposed farmyard manure?

Which type of cultivator—the spring or the rigid tine—do you find grips best, works deepest and leaves least bone? At what season do you find the disc cultivator most satisfactory; does it make the surface too fine? Have you tried the one-way orchard disc-cultivator: does it work uniformly, or is it liable to lift at the extreme end in stiff places?

Do you rear your cockerels to the age and weight to make them a good class of table poultry, or do you find it more profitable to dispose of them for what they will bring at an early age; and if so, at what age? What do you consider it costs to rear cockerels to five months' old, comparing White Leghorns and heavy breeds?

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse the opinions expressed.

Bimbaya.

A meeting of the members of this branch was held on 14th August last, when a paper was read by Mr. J. Britten on the proposed organisation of the dairying industry. The matter was discussed at length by members.

On 11th September the branch again met, the attendance being good. The subject set down for discussion was the unpopularity of rural life and the means to be adopted in making it more attractive. Members were of opinion that the drift of the agricultural population to the cities was becoming a serious matter. Several members considered that the farmers should pay their children a small weekly wage and give them a small department of the farm to manage under supervision; this would be an encouragement to them to take an interest in the working of it. Other members contended that the policy of catering for the city and studiously neglecting the country was at the root of the whole trouble.

Coraki.

A meeting of the members of this branch was held on 20th September, when there was a good attendance. Several new members were enrolled.

It was decided to again prepare an agricultural exhibit to be staged at the next Central Richmond River Agricultural Society's show, to be held on 18th and 19th February. It was also resolved to invite the pupils of the Coraki public school to participate in the distribution of seeds, providing they be grown and the results staged at the show.

A discussion ensued on the benefits of lime for agricultural purposes, and the flying-fox menace was also debated.

Cotta Walla.

A meeting of the members of the above branch was held on 8th September, when the result of Mr. T. A. Howard's potato crop was discussed. Messrs. G. W. Butt and T. A. Howard offered 1 acre each for potato plots to be conducted under the guidance of Mr. Makin, Inspector of Agriculture.

Cunningham.

A meeting of the members of this branch was held on 12th September. Following the disposal of general business, it was decided to try to arrange for a lecture on viticulture by Mr. H. E. Laffer, and a demonstration by Mr. J. W. Mathews, Sheep and Wool Expert.

Arrangements are being made for a party of the members to visit Temora Experiment Farm at an early date.

Dural.

At a meeting on 12th September an interesting lecture on manures was given by Mr. A. A. Ramsay, Principal Assistant Chemist.

Referring to the question of potash supplies, Mr. Ramsay remarked that the principal source in the future would be Alsace. Sulphate of potash was said to have given the better results in the past, but that form would be unobtainable for some time and chloride of potash would have to be used. Replying to a question as to why the fruit crops in this and other districts had apparently not suffered as a result of no potash being available. Mr. Ramsay said it was probable that enough potash had been applied previous to the stoppage to last for some time.

The use of good stone lime was recommended. The lime should be placed in heaps on the land and water then applied. When fully slaked the lime should be spread out and the surface ploughed or scarified to mix the lime with the soil.

Inverell.

At the monthly meeting on 5th September the members of this branch took leave of Mr. G. H. Arkinstall, who had intimated his resignation at the previous meeting. Members expressed themselves particularly appreciative of Mr. Arkinstall's work on behalf of the branch in the capacity of chairman.

Kellyville.

At the annual meeting of this branch the report showed that the past year had been an active one, ten meetings having been held, and two pruning demonstrations given by the Assistant Fruit Expert. The year closed with thirty-two financial members and a cash balance of £5 19s. 6d.

The election of officers resulted as follows:—Chairman, Mr. L. Stranger; Vice-Chairmen, Messrs. J. Nutter and H. H. James; Treasurer, Mr. H. Firth; Hon. Secretary, Mr. J. M. Firth; Assistant Secretary, Mr. G. Kearney.

Lidcombe.

The members of this branch made a visit to Mr. E. W. Horner's market garden at Ryde on 4th October, when a very instructive and enjoyable afternoon was spent. The members benefited by several useful hints as a result of the outing.

The third annual report of the branch states that for the year ending 10th August, 1919, fifteen general meetings were held, making up a useful year's work.

On the social side the branch had also been very active.

Co-operative buying of seeds, manures, &c., has been initiated by the branch with success. The balance-sheet discloses a credit of £2 3s. 3d. on the year's operations.

Lisarow.

The annual meeting of the members of this branch was held on 12th May last. The secretary's report showed that there was a membership roll of forty. Ten regular monthly and three special meetings were held during the year, and five lectures and demonstrations were given by Departmental officers during that period.

The purchase of a block of land on which to erect a building for a public meeting room or hall was also reported, to which object the sum of £32 13s. 3d. had already been subscribed.

The staging of an exhibit at the Gosford show in the village competition secured third place and a prize of £3.

The secretary urged the members to prepare and read papers on various subjects setting forth their own experiences and practices, thus providing a basis for discussions which would be helpful to all engaged in agriculture under local conditions.

The office-bearers elected for the ensuing year were:—Chairman, Mr. A. J. Thomas; Vice-Chairman, Mr. F. Jenkins; Treasurer, Mr. A. G. Henson; Hon. Secretary, Mr. A. L. Kelman.

Meetings of this branch have been held on 14th June, 12th July, 9th August, 6th September and 4th October, at all of which useful discussions took place.

March.

At the meeting of this branch on 23rd September a discussion took place on the subject of humus. Members were agreed as to its importance in the orchard and advocated the growth of green manure crops.

Moss Vale.

A well-attended lecture on poultry was given by Mr. James Hadlington, Poultry Expert, on 12th September. The lecturer dealt chiefly with the rearing of chickens, showing the class of brooders and houses most suitable. Many questions were asked and valuable information was gained.

Orchard Hills.

Mr. H. E. Laffer, Viticultural Expert, gave a very interesting lecture to the members of this branch on 8th September. Mr. Laffer dealt chiefly with budding and grafting, but also discussed diseases of the vine. Many questions were asked and answered and many useful hints were obtained.

Parkesbourne.

The annual meeting of the members of this branch was held recently when the following office-bearers were elected :—Chairman, Mr. W. H. Weatherstone; Vice-Chairmen, Messrs. C. Apps and G. Brown; Treasurer, Mr. J. Brown; Hon. Secretary, Mr. S. W. McAlister; Assistant Secretary, Mr. E. Weatherstone.

The branch has a membership of forty and has had a very successful year, being favoured by three visits from Departmental officers.

Quaker's Hill.

The above branch held a meeting on 20th September, when a discussion took place on Elephant grass, and it was decided to apply to the Department for a supply of seed or cuttings; it was also resolved to apply for maize seed. The matter of the Assistant Inspector's contemplated visit was brought before the meeting, when it was agreed to endeavour to convene a meeting of all residents to hear that officer's address.

Spencer.

At the last meeting of this branch a paper on pruning fruit trees was read by Mr. W. Sharpe, of the Matcham branch. The paper proved interesting and suggestive, and Mr. Sharpe was accorded a vote of thanks by those present.

Springside.

A meeting of twenty members of this branch was held on 16th September, when, after general business had been transacted, a paper was read by Mr. W. Giles on farm economy.

Economy on the Farm.

Mr. Giles considered that mixed farming was the best method of operating the farm for several reasons. In the first place, the farmer was not altogether "knocked out" by the failure of one crop; in the second, the soil was maintained in better condition and would yield better crops. Although cereals might be successfully grown by cropping in alternate years, or even by cropping two years in every three, there remained by this method every second or third year during which the area brought in nothing. Perhaps the most successful rotation on an average-sized farm was to divide the land so that each paddock was cropped one year with oats (either hay or grain), then with wheat (also for hay or grain) and then with potatoes; if the paddock was not fit for potatoes it could be left in the fallow and sown with green feed. Hay generally paid better than grain in the Springside district; but it was wise for the farmer to thresh his own seed, as he then had, in addition to the straw, the knowledge of exactly what his seed was and how clean.

All seed sown should be of the best: they could not afford to entertain the possibility of lower yield and poorer quality varieties in any crop they grew. All crops should be manured, for not only did fertilising invigorate the plants and pay for itself with profit by higher yields, but it also helped to keep down weeds (more especially of short or long-growing habits) by strengthening the crop so that they were choked. All cereal crops should be harrowed during the spring, to conserve moisture as well as to destroy weeds.

Every farm should have a few sheep for household purposes, but any man with a few acres of good bush land should be able to keep from fifty to one hundred Merino ewes, whose lambs, if fat, should command a good price as weaners. The best results would be obtained by crossing with British breeds, but if crossbreds were kept fences should be maintained in good and thoroughly rabbit-proof order, or the sheep would overrun the place. It paid to have a paddock or two sown with rape or other fodder on which the lambing ewes could be grazed. When the sheep were removed from such areas, the ploughing-in of the plant remainders and the droppings made excellent manure.

Another handy adjunct to the farm was a small area of fruit trees. The farmer should be able to grow all his own fruit on an area such as would not occupy more than a week's work in the year, although, like all other things, fruit trees needed attention if they were to be profitable.

Every farmer should have his own smithy and carpenter's shop and should take care of his machinery, sheltering it from the weather.

Every newcomer in the way of plants should be watched and those that were in any degree likely to prove a nuisance should be summarily uprooted.

Tallawang.

A demonstration on land clearing by explosives was given by Mr. C. W. Burrows, Field Assistant, at the farm of Mr. Joseph Bailey, on 30th September. The attendance was good.

A large gum stump was selected for the first part of the demonstration, thirty plugs of gelignite being placed under the stump at three different points, and at a depth of about 3 feet. The shot was fired by battery, and the stump after the explosion presented a very shattered appearance, making burning a very easy matter indeed. Several smaller shots were fired by the demonstrator by means of fuse instead of battery.

Members were satisfied as to the economy of the method, from both a labour and a monetary point of view. A hearty vote of thanks was accorded Mr. Burrows for his useful and instructive demonstration.

Thyra-Bunaloo.

The monthly meeting of the above branch was held on 9th August, there being an attendance of ten members. A paper on foot-rot in sheep, of which a summary follows, was read by Mr. W. Beer.

FOOT-ROT IN SHEEP.

It has been said that we never had foot-rot before the stations were subdivided. When the sheep were in very large paddocks they could walk continually, getting plenty of exercise; but when sheep came to be pastured on very rich, heavy-carrying country with plenty of feed they did not get sufficient exercise and the liability to foot-rot increased. The worst kind of foot-rot is that which breaks out like a boil between the toes of the sheep: this usually results in the sheep losing its hoof altogether. Wet land is not always responsible for the trouble, for cases are well known where sheep kept on flooded country have to walk all day through water to get their feed, but do not necessarily develop foot-rot. Sheep that have not previously had foot-rot do not readily develop the condition if they are forced to take sufficient exercise in getting their food.

Foot-rot is infectious—very infectious—and all sheep showing signs of the disease should be separated from the flock and clean sheep kept away from paddocks and yards where affected sheep have been. One well-known sheepowner told the writer last year that he had not a lame sheep on the place until a drover put about a dozen Merino ewes into his paddock because they were too lame with foot-rot to travel. The effect was considerable expense and loss to the sheepowner.

There are many so-called cures. One farmer has made the statement that he has had great success with an ingenious arrangement in connection with his lick trough. A shed is made from bush timber and roofed with iron, shingle, or bark to protect the lick from the weather. The dimensions of this shed are 9 feet long by 3 feet wide by 3 feet high to the eaves, with an overlap of the roof of at least 1 foot. Rails or saplings are nailed to the sides and ends in such a way that the sheep have access to the salt lick, but in order to do so they must stand in trays placed on each side of the shed, which contain burnt lime to a depth of 2 inches. The tray for the lime is at least 2 feet wide so that the sheep cannot reach the lick without standing on the lime, which has an excellent effect in checking the disease, though it will hardly effect a cure in bad cases. The trays for holding the lime can be made of strong galvanised sheet iron, and the roof over the lick trough should be finished with iron spouting.

Other sheepowners have been very successful in treating sheep-rot with strong solutions of arsenic. In one case a sheepowner had a number of heavily-woolled ewes that were badly affected with foot-rot. He started paring the hoofs of all the lame sheep and then treating with a strong solution of arsenical dip by running the sheep through a trough. However, he was unable to pare the hoofs of more than half the flock, and finally he put the whole lot through the solution. The result was that the sheep that had not had their hoofs touched with the knife were quite cured in a very short time, while the others were lame for months. Personally, I think paring the hoof is an advantage providing the knife does not go too deep. The foot should never be made to bleed.

The treatment most extensively used is swabbing with a strong solution of copper sulphate and quicklime, but the method is severe unless discriminately used.

DEPARTMENTAL NOTE.—Some notes on this subject by Mr. J. W. Mathews, Sheep and Wool Expert, will appear in an early issue of the *Agricultural Gazette*.

Tingha.

On 23rd July Mr. W. le G. Brereton conducted a demonstration of winter pruning under the auspices of this branch. The work was carried out in the orchard of Mr. Robilliard.

A visit was first made to Mr. Vickery's nursery, where a locally raised variety, Ernie's Seedling, had resisted the attacks of woolly aphis in a manner which had aroused considerable interest. Thereafter Mr. Brereton gave a demonstration of planting and pruning a young tree for the benefit of the boys of the public school. Of this a summary will appear next month.

At the last meeting of the members of the branch a discussion took place on the question of manures and manuring, the chief point of controversy being whether it was advisable to stack and rot stable manure or to apply it fresh. Advocates of the former method claimed that the manure was so freed from weed seeds and reduced to a more readily assimilable form. Those who favoured the other method contended that stacking and rotting meant a loss of valuable constitutents, whereas when applied fresh the full value of the manure went into the soil and became gradually available as it rotted. Growth of weeds could be suppressed by the cultivation necessary to maintain the soil in proper tilth.

DEPARTMENTAL NOTE.—When farmyard manure is stacked, comments the Chief Inspector of Agriculture on the above, there is a likelihood of some of the fertilising constituents being lost unless proper precautions are taken. To prevent this it is necessary to have a cement floor of a basin shape, and to add a little lime to the manure as it is stacked to fix the nitrogen. If such a manure heap is well handled there will be little loss of fertilising material, and the manure will have a quicker action upon plants when applied to the soil. During the fermentation of the manure all weed seeds will be killed, which is an important advantage, especially when small crops are grown, as weeding involves considerable labour. Generally speaking, the best value will be obtained from the manure when it is applied to the land quite fresh, as there is then no loss. The application of large quantities of fresh manure to certain classes of land, however, opens up the soil too much, and well-rotted manure has not this disadvantage.

Toronto.

A meeting of the members of this branch was held on 7th October. After the general business had been disposed of, a round-table discussion on poultry took place. A majority of the members present favoured Barred Rocks.

The secretary reported that several members of the branch visited the Stony Creek poultry yards during September, and were greatly interested. The demonstration on clearing land by the use of explosives, conducted by Mr. C. W. Burrows, Field Assistant, on 23rd September, was largely attended. The demonstration was much appreciated, and a hearty vote of thanks was accorded to this officer.

Wellington.

On 29th September Mr. J. Hadlington, Poultry Expert, visited this branch and gave a lecture on poultry keeping that was very much appreciated by all hearers. Mr. Hadlington pointed out that the distance from Sydney made it probable that poultry-keeping in Wellington would remain more of an adjunct to other pursuits, but there was nevertheless a profitable opening for the line in that district. Some time was spent upon the fowl tick, which is the great handicap to the business in the west.

Windsor.

A meeting of the members of this branch was held on 12th September. After the general business had been transacted it was agreed that the Government should undertake the work of ascertaining where possible the location of all flying fox camps, organising shooting parties and subsidising them with ammunition. It was suggested that the organisation of the scheme could be in the hands of district fruit inspectors, who would in all cases supervise the parties and distribute ammunition in order to prevent it being applied for other purposes.

It was decided to accept an invitation from Mr. H. W. Potts (Principal) to visit Hawkesbury Agricultural College at an early date.

Woonona.

The usual monthly meeting of the members of this branch was held on 9th September, when there was a good attendance of members. The following were elected officers for the ensuing year:—Chairman, Mr. E. Cameron; Vice-Chairman, Mr. E. Perkins; Treasurer, Mr. G. Fowler; Hon. Secretary, Mr. H. Coltman; Assistant Secretary, Mr. A. Cavill; Auditors, Messrs. Lutherborrow and J. W. Charlton; Librarian, Mr. A. Johnstone. The balance-sheet showed a credit balance of £25 13s. 3d. During the year seventy-four new members joined the branch.

Yarramalong.

The usual monthly meeting of the members of this branch was held on 8th October, when an interesting discussion took place on the flying-fox pest.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1920.

Society.	Secretary.	Date.
Kiama A. Society	G. A. Somerville	Jan. 24, 26
Nimbin A. and I. Society	B. R. Southwell	,, 27, 28
Gosford and Brisbane Water A. and H. Association (Gosford).	H. G. Parry	,, 30, 31
Berry A. Association	W. Pryor	Feb. 4, 5
Tweed River A. Society	T. M. Kennedy	,, 4, 5
Ulladulla A. and H. Association (Milton)	R. F. Cork	,, 18, 19
Dapto A. and H. Society	F. James	,, 20, 21
Wyong District A. Association	C. N. Walters	,, 21, 22
Alstonville A. Society	C. D. McIntyre	,, 24, 25
Inverell P. and A. Association	J. T. Dale	,, 24, 25, 26
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 24, 25, 26
Dorrigo and Guy Fawkes A. Association	R. R. Blair	,, 25, 26
Newcastle A., H., and I. Association	E. J. Dann	,, 25, 26, 27, and 28.
Yanco Irrigation Area A. Society	R. Tribe	Mar. 2, 3
Tenterfield P., A., and M. Society	E. W. Whereat	,, 2, 3, 4
Tumut A. Association	T. E. Wilkinson	,, 3, 4
Manning River A. and H. Association (Taree)	L. Plumer	,, 4, 5
Berrima District A., H., and I. Society	C. E. Wynne	,, 4, 5, 6
Wollongong A., H., and I. Association	W. J. Cochrane	,, 4, 5, 6
Mudgee A., P., H., and I. Association	E. J. Hannan	,, 9, 10, 11
Moruya A. and P. Society	H. P. Jeffery	,, 10, 11
Tumbarumba A. Association	W. R. Figures	,, 10, 11
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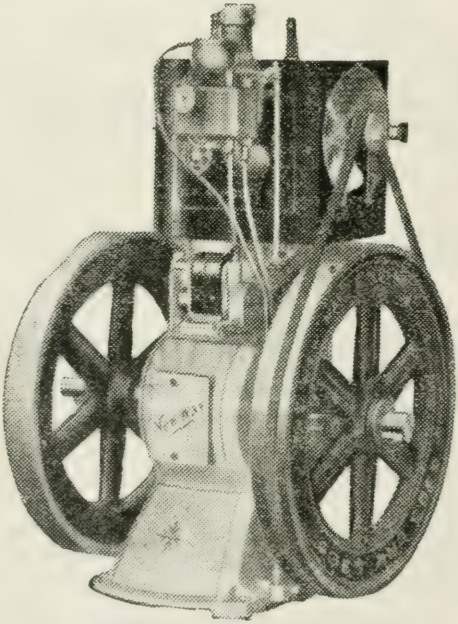

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2nd December, 1919.

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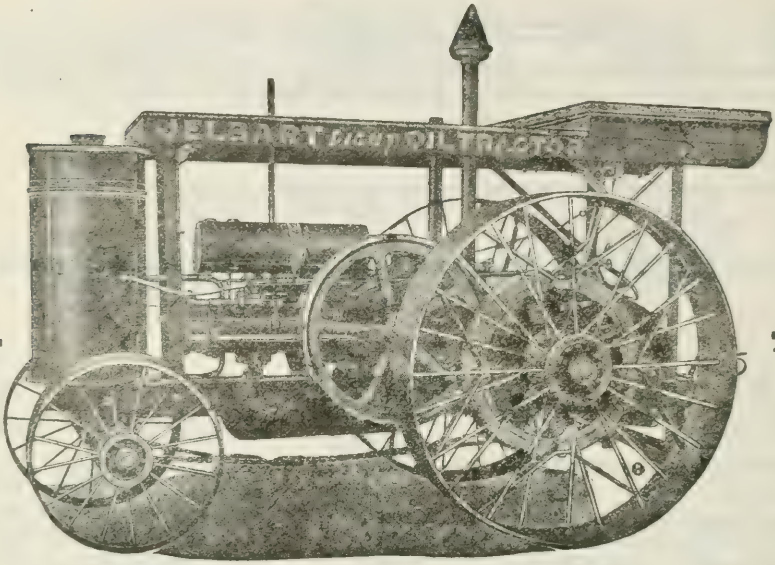

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Agricultural Gazette of New South Wales.

Sheep and Wool for Farmers.

CROSS-BREEDING EXPERIMENTS.

Aggregate Value for Wool and Mutton.

[Continued from page 421.]

J. WRENFORD MATHEWS.

Final and Combined Returns.

In entering upon the final review of this phase of the investigations, it would be as well perhaps to review past deductions, and to note how the breeds compare with one another respecting the various aspects of their use. So many issues are involved that no single merit can be counted upon alone. The serviceableness of the breeds must be reviewed from the broader standpoint of all-round efficiency. Because a breed excels in one particular direction, it does not necessarily follow that it fulfils all requirements. Its disabilities in some respects may quite overshadow its special recommendations. All points, therefore, that come reasonably within the scope of the investigations must be carefully measured, and all attributes of the breeds weighed, before one can make so bold as to say that either this one or that is the most useful type.

That our findings may not "square" on all scores with the ideas of others we are only too conscious. Prejudices and preferences, especially where vested interests are at stake, are not as a rule easily overthrown. Still, we hope by the evidence which can be brought to bear to be able to throw some light on the several vexed problems which hitherto have confronted those engaged in cross-breeding.

The various questions to which answers have been sought are set out in the following summary, in the sequence in which they arose :—

1. *Longwool on Merino.*—As the result of these and previous investigations, we can emphatically state that of all breeds none are so suitable for mating with the Merino as Longwools.

2. *Merino Ewe in preference to Longwool Ewe.*—In view of its natural adaptability to the country, and the manner in which it conforms sexually to seasonal conditions in the districts where cross-breeding can profitably be undertaken, it is preferable to mate the Merino ewe with British-bred sires, although in certain connections British-bred ewes may be mated to Merino rams with advantage.

3. *Time of Mating.*—Under the generality of New South Wales conditions, an autumn lambing is desirable. November and December have, therefore, been set down as the most seasonal months during which to run the rams with Merino ewes.

4. *Period of Service.*—In the case of the Merino, the period of sexual heat usually occurs on or about the seventeenth day, and the ewe generally remains in that state for about twelve days, although in some cases the duration is shorter, while in others it is longer. To secure pregnancy, the period during which the rams are run with the ewes should not be less than six weeks, and should not exceed two months; a longer mating period would result in an unduly protracted lambing.

5. *The Readiest Breeder.*—Further, it has been discovered that the crossbred ewe is a less ready breeder than the Merino. The Merino ewe will join with the ram at practically any period of the year. The crossbred ewe, on the other hand, shows a preference to certain months, and January and February are the months during which the rams perform the best service.

6. *Disposition to Breed.*—The disposition to breed was not apparent in any one breed more than another; in some cases it was noted that certain rams were more vigorous than others, but this was irrespective of breed.

7. *The Natural Increase.*—The figures taken in this relationship show the Leicester to an advantage of 6 per cent. in the aggregate over the Lincoln and Border Leicester, which were about equal, as the result of four years' mating at each of the three farms.

8. *The Disability of the Ewe.*—The records as to the difficulty often experienced by the ewe at parturition hardly confirm or detract from the merits of either of the breeds. The figures, in fact, are somewhat inconsistent, for while considerably fewer ewes mated to Leicester rams were assisted, the mortality, strange to relate, was slightly higher. On the other hand, the Border Leicester comes out with the highest percentage of those assisted, but with fewer deaths. The Lincoln occupies an intermediate position in both respects. In almost every case the trouble in respect of the Lincoln cross was due to largeness of head; while in the majority of instances that of the Border Leicester cross was through fullness of shoulders.

9. *The Older or Younger Ewes.*—On the point of difficulty at parturition, we could not discover the younger—the maiden ewe—to be physically any better constituted than the ones which were older. The opinion formed was that the older ewe was the best mother, and her affection in this respect more than compensated for any advantage which may be claimed for the younger ewe on the score of flexibility.

10. *Conformity in the Cross.*—Viewed from the standpoint of conformity, all breeds presented a fairly uniform blend, though in certain dimensions there were noteworthy differences that distinguished one cross from another. The Lincoln furnished, on the whole, the cross most regular in outline—a character that became more marked as the sheep advanced with age. The progeny of the Leicester, though square, was fairly short of body, but with particularly well-rounded hindquarters; a marked deficiency, however, was the comparative narrowness of the forequarter, and the shortness of the brisket. The Border Leicester produced a broad, long-bodied sheep, fairly equal in conformation, high on the leg, and with full hams deep shoulders, broad loins,

well-rounded girth, prominent brisket, and capacious chest, as the dimensions given in tables showing waist girth measurements indicate.

11. *The Lamb Stage.*—So far as first crosses go, the Border Leicester undeniably furnished the most suitable class of carcase for export, though it would be as well not to place too high an estimate on the value of the cross for this purpose at this stage. First crosses reach their maximum development between the 2 and 3 years' stage, so that to allow fair development, the 18 months' stage seems about the earliest stage at which the animals can be profitably marketed.

12. *Border Leicester's Advantage in Body-weight.*—The Border Leicester shows a material gain in body-weight over the other two crosses at practically all ages. The differences in its favour in the case of wethers, taken on the average from the ages of 1 year 5 months to 5 years 5 months, amounted to approximately 15 lb. as compared with the Lincoln, and 19 lb. as contrasted with the Leicester crosses. The increase in the case of the ewes was not so great. Taken up to the 8 years 5 months stage, it showed an average of 6 lb. over the Lincoln and 11 lb. over the Leicester.

13. *The Lincoln's Advance in Wool Weight.*—The Lincoln maintained supremacy throughout in the matter of wool production. In the case of the wethers, the results reveal a gain covering all ages of 1 lb. 6 oz. over the Border Leicester, and 1 lb. 5 oz. as contrasted with the Leicester. With the ewes the difference was 1 lb. 2 oz., as compared with both English and Border Leicesters, which were about equal.

14. *Variability and Coarseness of Lincoln Cross Wool.*—Less variation in the wool appeared among both Leicester and Border Leicester crosses than with the Lincoln. The wool of the latter was also coarser, though the extra weight of fleece stands as a compensating factor in assessing its total monetary value.

15. *Higher Yielding Qualities of Border Leicester Cross Wool.*—On the whole, the Lincoln cross gave the highest clean yield; but taking quality for quality, or grade for grade, the Border Leicester cross produced a higher yielding wool than either of the strains with which it was competing.

16. *Higher Value of Border Leicester Wool.*—Owing to its finer quality, Border Leicester cross wool is, on the average, 1½d. per lb. more valuable than Lincoln cross wool, and, further, owing to its higher yield, is about ½d. per lb. more valuable than the wool of the Leicester cross.

The Mutton Value.

Turning now to discuss more fully the main problem—which combination gives the best monetary return for wool and mutton under certain conditions—we proceed to consider whether the heavier fleece of the Lincoln cross can more than balance, in the aggregate, the heavier carcase and higher-priced wool of the Border Leicester.

In the article published in this journal in June the details of the woo returns were furnished, but so far we have not touched upon the value of the mutton. Like the wool, this shows considerable fluctuations in value from year to year. Different rates also rule for different grades. Weight of carcase is the prime factor in determining the value of different classes of mutton, and this depends mainly, if not altogether, on the age of the sheep. Age is a most important factor in assessing the mutton value of the various crosses at the different ages. The lighter weight carcases, provided of course that the mutton is prime and of good quality, are more valuable on a basis of so much per pound than heavy-weights. Traders as a rule discriminate between the value of carcases on the following scale of weights:—

1. Handy lights to moderate heavies, range from 50 to 60 lb.
2. Moderate heavies to heavy weights, from 60 to 100 lb.

For the purpose of comparison and calculation, the following statement presents the rates ruling for the various grades of mutton since the trials were instituted.

Year.	50 to 60 lb. Carcases.	60 to 100 lb. Carcases.
1911	2¼d. to 2½d.	1⅞d. to 2¼d.
1912	2¼d. to 2½d.	1⅞d. to 2¼d.
1913	2¼d. to 2½d.	1⅞d. to 2¼d.
1914	3½d. to 3¾d.	3¼d. to 3½d.
1915*	4d. to 4¼d.	3¾d. to 4d.
1916†	5⅝d.	5⅛d.
1917†	5⅝d.	5⅛d.
1918†	5⅝d.	5⅛d.

* Ewes, ¼d. per lb. less. † Ewes, 5d. per lb since 1916.

From these returns it is at once evident that mutton values have been steadily on the increase, practically since 1913 The prices given have been put on an exportable basis throughout. Prior to 1916, they were for those ruling for sheep bought at auction in the various markets of the Commonwealth, and placed f.o.b. Since then, however, as in the case of wool, all supplies available for export have been commandeered by the Imperial Government, at the rates as specified in the above schedule of values.

With prices on the change from year to year, and with values occupying such a wide range, the task of computing the returns to show relatively the position of the crosses at the different ages during the whole period of the investigations is by no means an easy one. Moreover, the lower rates ruling for mutton during the earlier periods of the trials operated against the younger, as compared with the older sheep, in working out the returns for the various ages in the aggregate.

Difference between Live and Dressed Weight.

It is necessary, first, to ascertain the difference between live and dressed weights. Sheep are bought and sold on an estimation of the weight they will yield of dressed mutton, plus the value of the skin and other marketable by-products.

The simplest and most accurate means of ascertaining this would have been to have had a number of the sheep slaughtered, and the dressed weights, &c., recorded in the ordinary way, but this was found to be impracticable, as the body and fleece weights of both ewes and wethers had to be taken each year. Moreover, the ewes were bred from year to year, and to have sacrificed them before the full period had been completed would have detracted from the value of the tests in other important directions. Opportunity has been taken, however, to record the live and the dressed weights of sheep forwarded from year to year to the Sheep Show in Sydney, and Table I embodies the particulars obtained on these occasions. The weights lost during transit from the various farms to the shows are also recorded.

TABLE I.—Showing (1) difference between live and dressed weights of various crosses, at several ages, from three respective farms; (2) difference between green and dry weights of skins; (3) loss of weight in transit from farms to New South Wales Sheepbreeders' Association's Shows, 1913 and 1914.

Cross.	Age.	Live Weights.		Carcase Weights.		Skin Weights.		Fat.	Paunch and Entrails	Liver, Heart, and Lungs.	Head and Shanks.	Blood.
		Ex Paddock.	Ex Truck.	Hot.	Cold.	Green.	Dry.					
				From Wagga Experiment Farm, 1913.								
	yrs.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
L_1M	3	187	168	102	99	25	17	10	13	6	7	4
L_2M	3	173	159	92	89	24	16	11	17	5	6	4
L_3M	3	182	168	102	99	22	16	12	11	6	7	5
L_1M	2	152	137	75	71	24	17	10	11	5	7	5
L_2M	2	137	126	71	68	20	13	10	10	5	6	5
L_3M	2	155	141	82	78	21	14	9	11	6	7	5
L_1M	1	100	90	50	47	14	10	6	9	4	4	3
L_2M	1	107	97	53	50	17	12	7	7	4	5	3
L_3M	1	123	114	63	60	18	13	7	10	5	6	4
				From Bathurst Experiment Farm, 1913.								
L_1M	2	151	141	74	70	22	14	9	18	5	7	6
L_2M	2	136	129	70	67	18	12	10	16	5	6	4
L_3M	2	166	151	83	80	20	12	12	18	5	7	5
L_1M	1	130	122	65	62	18½	12	8½	16	5	6	4
L_2M	1	141	127	64	61	22	13	8	18	5	6	4
L_3M	1	158	144	80	79	20	11	10	18	5	7	5
				From Cowra Experiment Farm, 1913.								
L_1M	2	136	130	70	66	19	13	9	18	5	6	4
L_2M	2	144	137	75	71	19	12	8	19	5	6	4
L_3M	2	156	148	85	81	17	11	11	19	5	7	5
L_1M	1	100	96	48	45	17½	11	5	15	4	5	3
L_2M	1	103	98	50	46	17	11	5	15	4	5	3
L_3M	1	107	101	53	49	15½	10	5	15	4	5	4
				From Wagga Experiment Farm, 1914.								
L_1M	3	174	164	90	88	25	18	17	13	4	7	6
L_2M	3	158	151	88	86	22	15	13	14	7	8	6
L_3M	3	183	174	100	98	26	18	11	16	7	7	7
L_1M	2			(None killed on this occasion.)								
L_2M	2	147	139	79	75	24	18	10	11	4	6	4
L_3M	2	155	147	81	80	19	14	13	17	6	7	5
L_1M	1	126	118	65	63	20	14	8	10	6	6½	3½
L_2M	1	114	106	60	57	18	13	7	9	4	5	4
L_3M	1	128	119	68	66	17	11	8½	13	3½	6	3½

TABLE I.—Showing difference between live and dressed weights of various crosses, &c., at several ages—*continued.*

Cross.	Age.	Live Weights.		Carcase Weights.		Skin Weights.		Fat.	Paunch and Entrails.	Liver, Heart, and Lungs.	Head and Shanks.	Blood
		Ex Paddock.	Ex Truck.	Hot.	Cold.	Green.	Dry.					
From Bathurst Experiment Farm, 1914.												
	yrs.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
L_1M	2	135	125	64	62	20	13	12	15	4	6	4
L_2M	2	127	116	64	62	16	11	19	13	4	5½	3½
L_3M	2	164	156	82	81	19	13	14	21	6	7	5
L_1M	1	102	93	45	42	17	11	5	13	5	5	3
L_2M	1	115	106	59	57	15	10	8	11	5	5	3
L_3M	1	110	103	51	48	16	11	7	14	5	6	4
From Cowra Experiment Farm, 1914.												
L_1M	3	143	141	79	78	20	13	10	18	4	5	5
L_2M	3	157	147	81	80	22	13	11	17	5	6	5
L_3M	3	180	168	100	99	18	12	14	19	5	7	5
L_1M	2	133	127	66	63	18	12	8	18	6	7	4
L_2M	2	125	117	65	63	16	11	7	13	6	6	4
L_3M	2	141	125	68	66	16	11	7	18	6	6	4
L_1M	1	106	97	50	47	16	11	7	12	4	5½	3½
L_2M	1	108	103	56	53	14	9	7	14	4	5	3
L_3M	1	119	112	61	58	16	11	7	13	5½	6	3½

The loss in weight occasioned by bringing the sheep from the farms in question to the show cannot fail to attract attention, and a digression may be permitted while we place definitely on record the information that was gained in that connection.

On being taken off the pasture, the sheep were shut up for fifteen hours. They were weighed immediately prior to trucking, and again on arrival at their destination at the show grounds. From the time they were first taken in hand, they received neither food nor water, in order that the weights in each case might be for the sheep when empty. From the records so obtained on the occasion of the 1914 consignments, the following statement has been compiled:—

Wagga Experiment Farm.

Twenty-four hours on trucks. Distance, 314 miles from Sydney. Average speed of train, 13 miles per hour.	4-year-old sheep lost 11 lb. 3 ,, ,, ,, 7 ,, 2 ,, ,, ,, 6 ,,	Slightly damp.
	1 ,, ,, ,, 8 ,,	Quite dry.

Cowra Experiment Farm.

Twenty-four hours on trucks. Distance, 297 miles from Sydney. Average speed of train, 12 miles per hour.	3-year-old sheep lost 10 lb. 2 ,, ,, ,, 9 ,, 1 ,, ,, ,, 7 ,,	Perfectly dry.

Bathurst Experiment Farm.

Eighteen hours on trucks. Distance, 145 miles from Sydney. Average speed of train, 8½ miles per hour.	3-year-old sheep lost 11 lb. 2 ,, ,, ,, 8 ,, 1 ,, ,, ,, 8 ,,	Slightly damp.

The loss was therefore proportional to the size and weight of the different crosses, and amounted to approximately 6 per cent. of the live weight as recorded before trucking.

Proportion of Dressed to Live Weight

The most practical purpose of Table I, however, is to enable us to ascertain the ratio of dressed to live weight. At first sight, it might appear that the dressed is approximately half the live weight. A closer examination of the returns, however, will disclose that the proportion is governed by two factors, (*a*) the age, and (*b*) the condition of the sheep.

An example is afforded by contrasting the average weight of Border Leicester wethers at the ages of 1 year 5 months and 3 years 5 months, sent from the three farms for both the 1913 and 1914 shows. Grouped at the former age for the three farms, the sheep averaged a dressed weight of 60 lb., whereas the average weight at the farms was 119 lb. At the latter age, the average weight at the farm was 182 lb., while the dressed weight, under similar circumstances, was 100 lb. Other examples may be obtained by comparing the other crosses at the various ages.

To enable the returns to be contrasted in this particular, I have prepared, from the figures given in the main table, the following summary, which distinguishes between the live and dressed weights from the standpoints of (*a*) the weights taken on the farms, and (*b*) off trucks, Sydney.

TABLE II.—Showing percentages of dressed to live weight of wethers forwarded from Wagga, Cowra, and Bathurst farms, for the New South Wales Sheepbreeders' Association's Show, 1913 and 1914.

Cross.	Percentage of Dressed Weight to Live Weight.	
	Ex farms.	Ex trucks.
3 years 5 months.		
	per cent.	per cent.
L_1M	53·8	57·3
L_2M	51·9	55·4
L_3M	55·4	59·2
2 years 5 months.		
L_1M	49·3	53·0
L_2M	51·9	55·0
L_3M	51·3	54·4
1 year 5 months.		
L_1M	48·7	52·4
L_2M	49·7	53·7
L_3M	50·5	54·5

Comparing, first, the returns for the crosses individually at different ages and then one with another, it may be confidently asserted that in proportion to their total body weight the older sheep yield relatively a higher percentage of dressed mutton than the younger sheep, although the difference does not amount to very much.

We cannot show the proportions of the sheep up to the 5 years' stage, as in other records of the tests, but, taking the results at 1 and 2 years, it would appear as if half the live weight would be a fair basis of comparison on which to compute the returns. The figures offer two percentages—the first being the dressed weight as percentage of the weight at the farms, and the second being the dressed weight as percentage of weight ex trucks. The first is of greatest value, seeing that the object is to arrive satisfactorily at a reliable means of reconciling the dressed with the live weight according to the records which are taken at the time of shearing.

Then, again, it must be borne in mind that the sheep from which these dressed weights have been taken carried only a nine months' fleece. The additional three months would increase the weight of the fleece (and for that matter the skin) by one quarter. This would naturally reduce the percentage of dressed as contrasted with the total live weight.

In the compilation of the returns, to show the aggregate value of wool and mutton, we have, in the case of each cross, and all ages, added the weight of the fleece to that of the body, and divided the total by half. The method may be the means of placing one cross at slight disadvantage as compared with another, for on reviewing the results shown in the preceding summary, it has been noted that the Border Leicester cross yields relatively a greater proportion of dressed mutton to the total live weight than does either of the other two crosses.

As compared with the Lincoln, at the 3 years' stage the Border Leicester shows to advantage by 2 per cent, and its gain over the English Leicester at this stage is 3½ per cent. At 2 years, the Border Leicester is again 2 per cent. in advance of the Lincoln, but is itself surpassed by the English Leicester, although only to the extent of ½ per cent. At 1 year old the Border Leicester gives the Lincoln 2 per cent., and the English Leicester 1 per cent.

Average Value of Mutton.

Having now provided a reliable means of assessing the value of the mutton, and having traced the relationship between the dressed and the live weights, we may advance a step further towards finalising the results. The following schedule is based upon the rates ruling throughout the trials:—

AVERAGE Value of the Mutton of the various crosses at different ages.

Farm.	L_1M.		L_2M.		L_3M.	
	Wethers.	Ewes.	Wethers.	Ewes.	Wethers.	Ewes.
1 year 5 months.		Years 1911–14.				
Wagga	2·75	2·625	2·81	2·625	2·75	2·625
Cowra..	3·25	3·	3·25	3·	3·25	3·
Bathurst	3·25	3·	3·25	3·	3·	2·81
2 years 5 months.		Years 1912–15.				
Wagga	3·	3·	3·125	3·	3·	3·
Cowra...	3·65	3·62	3·65	3·62	3·50	3·37
Bathurst	3·65	3·62	3·65	3·62	3·50	3·37

AVERAGE Value of the Mutton of the various crosses—*continued.*

Farm.	L_1M.		L_2M.		L_3M.	
	Wethers.	Ewes.	Wethers.	Ewes.	Wethers.	Ewes.
3 years 5 months.		Years 1913–16.				
Wagga	3·5	3·68	3·7	3·68	3·5	3·68
Cowra	4·44	4·31	4·37	4·31	4·31	4·31
Bathurst	4·44	4·31	4·37	4·31	4·31	4·25
4 years 5 months.		Years 1914–17.				
Wagga	4·375	4·1875	4·4	4·1875	4·34	4·1875
Cowra	4·84	4·68	4·84	4·68	4·68	4·68
Bathurst	4·84	4·68	4·84	4·68	4·68	4·68
5 years 5 months.		Years 1915–18.				
Wagga	4·84	4.56	4·8	4.56	4·84	4·56
Cowra	5·125	5·	5·125	5·	5·125	5·
Bathurst	5·125	5·	5·125	5·	5·125	5·

Value of Skin and Mutton.

As a further exposition of the respective merits of the crosses, particulars of skin and carcase values have been tabulated in connection with the sheep slaughtered and exhibited at the Sheep Show on the occasions previously referred to.

It should be remembered that the rates upon which values were calculated were those ruling for wool and mutton only during the years in question.

Two sets of figures have been prepared for the years 1913 and 1914. The one shows separately the weight, shrinkage, quality, and value of the skins; and the other, the combined value of the different crosses, skin and carcase as a whole, as well as, for the year 1913, the exporter's comments on the merits of the carcases. It is intended that these particulars (which make considerable demands upon space) shall be published in another form at an early date.

The Final Return.

Finally, we are faced with the task of placing the results on a comparable basis, so that it may readily be seen how the breeds stand, one with another, in their commercial relationships.

While the breeds must, from the nature of the investigations, be contrasted as to their physical adaptability for the purposes outlined, we have, nevertheless, all along endeavoured to keep the commercial aspect well in view. That, indeed, can never be disregarded, for unless they are satisfactory in that respect the tests must obviously lose much of their value.

In the final computations, the returns have been so arranged as to show the results of the three crosses at the various ages—first, for each farm separately, then the consolidated averages for the full period, and finally the values for wool and mutton combined.

Having brought the work to this stage, we can only leave the results to testify for themselves as to the values of the competing strains. The final statement, which is appended, embodies the conclusions.

Details of the body and fleece weights of the three crosses at each of the three farms have also been tabulated with a view to publication in another form.

TABLE III.—Showing Combined Averages for the different Crosses at the Bathurst, Cowra, and Wagga Experiment Farms.

Cross.	Live Weight.		Dressed Weight.		Price per lb.	Carcase Value.		Wool Weight.		Price per lb.	Wool Value.		Total Value.	
Wethers.														
1 year 5 months.														
	lb.	oz.	lb.	oz.	d.	s.	d.	lb.	oz.	d.	s.	d.	s.	d.
L_1M	95	5·4	53	0	3·08	13	7·24	10	10·4	11·88	10	6·52	24	1·76
L_2M	94	6·5	52	2	3·10	13	5·39	9	15	11·74	9	8·58	23	1·97
L_3M	107	2	58	7	3	14	7·2	9	11·6	12·91	10	5·23	25	0·43
2 years 5 months.														
L_1M	125	9·4	69	0	3·43	19	8·67	12	5·4	12·82	13	2·16	32	10·83
L_2M	121	3·5	66	2	3·48	19	2·1	11	1·1	13·17	12	1	31	3·1
L_3M	137	1·7	74	1	3·33	20	6·62	11	1·1	14·74	13	7·02	34	1·4
3 years 5 months.														
L_1M	140	9·8	77	0	4·13	26	6·01	13	7	13·93	15	7·36	42	1·37
L_2M	135	5	73	6	4·15	25	4·5	11	7·3	15·48	14	9·34	40	1·84
L_3M	155	9·5	83	7	4·04	28	1·49	11	5·4	16·64	15	8·65	43	9·74
4 years 5 months.														
L_1M	144	10	78	6	4·69	30	7·58	12	3·2	15·64	15	10·8	46	6·38
L_2M	135	9·4	73	4	4·69	28	7·54	10	14·2	16·5	14	10·20	43	5·74
L_3M	155	4·6	84	12	4·57	32	3·31	11	1	17·74	16	4·70	48	8·01
5 years 5 months.														
L_1M	151	13	82	3	5·03	34	5·4	12	9	15·60	16	3·62	50	9·02
L_2M	143	8·1	77	6	5·02	32	4·42	11	3·2	16·48	15	3·6	47	7·72
L_3M	163	6·3	87	3	5·03	36	6·55	11	0·5	17·71	16	3·36	52	9·91
Ewes.														
1 year 5 months.														
L_1M	85	6·3	47	6	2·875	11	4·2	9	7	11·5	9	0·5	20	4·7
L_2M	84	1·5	46	6	2·875	11	1·32	8	11·7	11·86	8	7·55	19	8·87
L_3M	93	8	51	4	2·812	12	0·11	8	15	12·02	8	11·43	20	11·54
2 years 5 months.														
L_1M	98	2·9	54	1	3·41	15	4·35	9	14·8	13 39	11	0·89	26	5·24
L_2M	95	9	52	6	3·41	14	10 6	9	4·4	13·61	10	6·23	25	4·83
L_3M	107	0	58	1	3·24	15	8·12	9	2·5	14·07	10	8·82	26	4·94
3 years 5 months.														
L_1M	107	3·2	58	14	4·1	20	1·4	10	10·4	14·10	12	6·16	32	7·56
L_2M	102	1·3	55	11	4·1	19	0·3	9	5·3	15·47	12	0·29	31	0·59
L_3M	111	2·4	60	4	4·08	20	5·82	9	6	15·51	12	1·33	32	7·15

TABLE III.—Showing Combined Averages for the different Crosses at the Bathurst, Cowra, and Wagga Experiment Farms—*continued.*

Cross.	Live Weight.		Dressed Weight.		Price per lb.	Carcase Value.		Wool Weight.		Price per lb.	Wool Value.		Total Value.	
					Ewes—*continued.*									
4 years 5 months.														
	lb.	oz.	lb.	oz.	d.	s.	d.	lb.	oz.	d.	s.	d.	s.	d.
L_1M	106	5·4	58	3	4·52	21	11	10	2	15·23	12	10·28	34	9·28
L_2M	101	9·5	55	5	4·52	20	9·96	9	1·4	16·76	12	8·23	33	6·26
L_3M	112	3·6	60	9	4·52	22	9·75	8	14·8	17·34	12	10·75	35	8·50
5 years 5 months.														
L_1M	108	9·6	59	2	4·85	23	10·75	9	10·3	15·39	12	4·41	36	3 16
L_2M	102	9·3	55	7	4·85	22	4·88	8	5	16·81	11	7·73	34	0·61
L_3M	111	8·3	60	0	4·85	24	8	8	7	17·78	12	6·06	36	9·06
6 years 5 months.														
L_1M	104	6·5	57	0	5	23	9	9	8	15·82	12	6·29	36	3·29
L_2M	99	5	53	5	5	22	2·5	7	6·8	17	10	6·22	32	8·72
L_3M	107	2·1	57	12	5	34	0·75	8	8	17·34	12	3·39	36	4·14
7 years 5 months.														
L_1M	106	8·6	57	8	5	24	4·5	8	9	15·63	11	1·83	35	6·33
L_2M	101	3·4	54	2	5	22	6·62	7	0	16·37	9	6·59	32	1·21
L_3M	109	11·7	58	12	5	24	6	7	11	16·66	10	8·07	35	2·07

AGRICULTURE'S PLACE IN GENERAL EDUCATION.

THE agriculture of the common school should be educational agriculture rather than agricultural education of a pointed sort. The justification for the inclusion of agriculture in the schools is its emerging as an organized body of knowledge of science representing important fundamental human interests . . . . Regarding method, though the art of agriculture cannot be exhaustively taught and though the science basis in agriculture constitutes the permanent educational material furnished by the subject, agriculture is an applied science and the concrete method must be used to illustrate and establish principles and laws. This is expressed in concrete studies of soils in the schoolroom, in the school garden, on the farm, in railway and road cuttings, and in home gardens, and in the adjustment of treatment to suit the peculiarities of different soils . . . . In other words, the science of agriculture should be taught through real agriculture and horticulture. This view of the subject does away with the deadly memorizing study and also does away with narrow vocational teaching . . . Agriculture is not yet second nature with teachers, but it must be incorporated in the experience of teachers just as other subjects are, and must find a place in the public schools and high schools, in the normal school, and in summer schools.—JAS. MCCAIG, in the *Agricultural Gazette of Canada.*

POINTS IN FALLOWING ON HEAVY SOILS.

IN agriculture, as in other industries, even the most proven systems sometimes show results that suggest that they are not under all conditions impeccable: obviously, the best system is the one that is most generally successful. A correspondent recently pointed out that in certain parts of the south—usually on heavy soils—fallowed ground had absolutely failed during the present growing season, and as it appeared that the failure was not due to lack of fertilising or of effort on the part of the farmers interested, he wondered whether any reasons could be offered.

It can only be said that the results from fallowed land are occasionally disappointing, but the poor growth is in nearly all cases due to the land not being compacted sufficiently. The trouble is generally most marked on heavy lands, especially on what are known as black or dark soils, as these naturally do not consolidate to the same extent or so quickly as lighter soils. The trouble may also occur to some extent in very light soils.

In an ordinary season—that is, when the soil is ploughed in a fairly moist condition, and good rains fall on the fallow – the soil naturally becomes compact, but when the soil is ploughed dry and no rain of any importance falls on the fallowed land, it remains in a loose condition. It is a matter of common knowledge that wheat requires a very firm seed-bed. As a matter of fact, this is the case with all crops, but the ill effects of a loose soil are more noticeable in the case of wheat, as it is grown under comparatively dry conditions. When the soil is loose, air circulates too freely and causes a loss of moisture: further, the roots are not able to make full contact with soil particles.

It is principally because a loose soil is so objectionable that deep ploughing has not proved satisfactory for wheat. The ideal conditions for wheat exist when the land which has been well ploughed in the spring, has had sufficient rain to make it compact, and has been lightly surface-cultivated. For sowing, the ideal seed-bed has a fine, shallow surface, with a firm bed.

Some time ago a very marked instance of the difference in yield due to different methods of cultivation came under our notice. In one case the land was well ploughed and subsequently given shallow surface cultivation only, while in the other the land was ploughed several times. The yield from the lightly cultivated land was over 43 bushels per acre while that of the much-worked area was less than 10 bushels.

Generally sufficient rain falls during the fallow to put the soil into a desirable condition, but when it fails measures should be adopted as far as possible to bring it into a firm state. Running a fair number of sheep on the fallow paddocks will considerably improve the condition of the soil. A heavy rolling after the crop is up, followed by a light harrowing, has a most beneficial effect on loose soils. The roller has been practically discarded by wheat-growers, but it is undoubtedly of considerable value when the soil is in a loose condition.—A. H E. McDONALD, Chief Inspector of Agriculture.

DURING October, 1919, the following plants were declared by the Muswellbrook Shire Council to be noxious within its area: *Rubus fruticosus* (blackberry), *Rosa rubiginosa* (sweet briar), and *Lycium barbarum* (African or Barbary boxthorn).

Sweet Clover in the New England District.

R. W. McDIARMID, Inspector of Agriculture.

THE success of sweet clover or Bokhara clover (*Melilotus alba*) for grazing purposes on the farm of Mr. Albert Sommerlad, of Tenterfield, during the past few years has caused many inquiries and induced many farmers to investigate its merits. At the outset of his experiments Mr. Sommerlad was confronted by adverse reports regarding the crop's palatability for stock, but he speedily satisfied himself on this point by trials with his own cattle and incidentally learned something, before proceeding with his venture, of the crop's valuable qualities as a deep-rooted and hardy legume. He now grows up to 40 and 50 acres each year with undoubted success.

Sweet Clover (Bokhara Clover) on Mr. A. Sommerlad's Farm, Hillcrest Tenterfield.

Under the Department's system of farmers' experiment plots, several small sowings of 1 to 5 acres were made during the winter and spring months of 1918 in the Tenterfield, Glen Innes, Uralla and Tamworth districts. The sowing season was a dry one, and as this clover needs plenty of moisture for a good germination, the strike of seed in each place was not what was desired. Sufficient seed germinated on each of the plots, however, to prove beyond doubt its hardiness and its palatability to stock.

Being sown in July and favoured with several moist days at sowing time, the Uralla plot germinated splendidly. At Glen Innes the stand was not quite so good. The March-sown plot at Red Range was much better than the August sowing at "Ardlair," on the Grafton road. At Tamworth the seed was sown in the last week of August and a fair germination resulted. The worst germination occurred at Tenterfield, with unfavourable conditions for sowing, early in September. The seed was sown on inferior land at Uralla, Glen Innes, and Tenterfield, while at Tamworth red soil was utilised. The soil which naturally set hard and readily compacted with rain gave the best germinations. Loose soils which remained friable and loose after rain gave practically no germination; this was very noticeable at Red Range. The most successful stands were obtained where the roller was used to compact the seed, bed, and to cover the seed after sowing.

Sweet Clover at Tenterfield.

This is the second year's growth, snapped in November, 1917. The man in the crop is 6 feet high, but the extreme height ultimately attained by the clover was 11 feet.

The Season and the Growth Made.

The rainfall during the past year was much below normal years and generally insufficient for crops. The natural grasses were very poor and feed generally was very scarce throughout the district. The growth made under such dry conditions and following so closely after sowing, proved the hardiness of sweet clover, and so impressed the experimenters that they increased their areas this season by 3 to 5 acres. There was a good green shoot on the clover throughout the summer months and it afforded sufficient growth to test its palatability and show its effect on the stock, but there was not sufficient growth to cut for hay, as is usual under average seasons from the first year's growth—owing chiefly to the scarcity of other green feed and of other grazing. When left, however, second-year clover attained a height of 5 feet at Tenterfield and matured its seed. During the previous year at Tenterfield the second-year clover grew to a height of 11 feet, and the first-year clover was made into hay.

Palatability and Effect on Stock.

Contrary to reports concerning its palatability, it was found that stock readily took to the clover and became very fond of it. It contains a bitter principle that stock may be opposed to sometimes, but once they acquire the taste for it they eat it very readily. Cattle, sheep, and horses fatten on it, and cows improve in milk yield. When grazed while the clover is young the bitterness is not so pronounced, and the taste is more readily acquired. In no case did bloat occur, and Mr. Sommerlad in particular has always found the crop safe and reliable for grazing purposes. Its aroma and bitterness are usually suspected of tainting the milk, cream, and butter, but Mr. Sommerlad has found this objection—which would probably exist if the cows were grazed on the clover immediately prior to milking—inapplicable if the feeding follows the milking. If any stock weak and low in condition were put on to this clover, a rapid recovery was observed.

Sweet Clover hay is readily eaten by cattle.

Indirect Benefits and Uses.

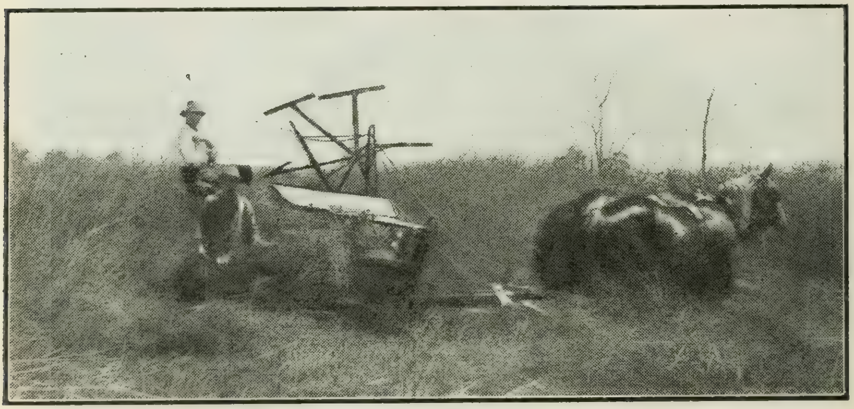
The effect on the soil, when the paddocks have been down to clover for two years, is now being noted. There is a marked difference in the mechanical condition of the land, and the growth of succeeding crops has very distinctly shown the benefits to be derived from a previous growth of sweet clover. Turnips grown last year after clover were by far the best ever grown at this farm, individual turnips weighing up to 27 lb. The crop of oats grown after sweet clover looked particularly well, and promised very good returns in spite of the droughty conditions prevailing.

The cultivation of this clover in the New England district promises exceedingly good results in many directions, and the crop will be extensively grown when properly known and understood. Its greatest drawback appears to be the difficulty in getting a good germination, a difficulty also noticed in other countries; although Mr. Breakwell, Agrostologist, says he has experienced no such difficulty, having obtained good germination at Hawkesbury Agricultural

College, on coastal experiment plots, and at Cowra, Glen Innes, and Yanco. It has been proved in America to make good fertile land out of land considered to be unfit for farming, and its ability to grow in such soil has been clearly demonstrated at Tenterfield.

General Habit of the Crop.

Although biennial in its growth, by preventing it from seeding in the second year, Mr. Sommerlad has found sweet clover to live three years; an annual strain is also undergoing trial. The ordinary type usually makes no flowers or seed the first year, but does so profusely in the second. It is a summer-growing plant, with no growth during the winter months as a rule, but by different treatments Mr. Sommerlad has had it green each month of the winter as well. It springs very early and rapidly in the late winter months, producing green feed long before lucerne under the same conditions. Lucerne cannot be considered very satisfactory in the New England district, and it is thought sweet clover will fill the gap.



Harvesting Sweet Clover for Seed.

Although it naturally dies out after two years, sufficient seed is generally dropped to re-seed even land that is never cultivated. This last fact is in evidence at Tenterfield, where the clover is still growing and spreading from the original plant grown eighteen years ago on the farm.

The seed is best sown in the autumn and spring months, using from 10 to 18 lb. an acre. The most satisfactory way to germinate the seed is to work up a fine and compact seed-bed, covering the seed very lightly and rolling the land after sowing. With a properly prepared seed-bed, the seed lightly covered and rolled, and an average season, no trouble should be experienced in starting the clover. When once it starts it roots very deeply and will withstand droughts and severe winters.

The feeding value of sweet clover as green feed or hay is very similar to lucerne and red clover. Throughout the New England district a legume is badly needed that will improve the pastures and hay crops. Sweet clover should meet these requirements, and when its value becomes properly appreciated it is probable that its cultivation will become extensive.

The Digger Chalcid Parasite

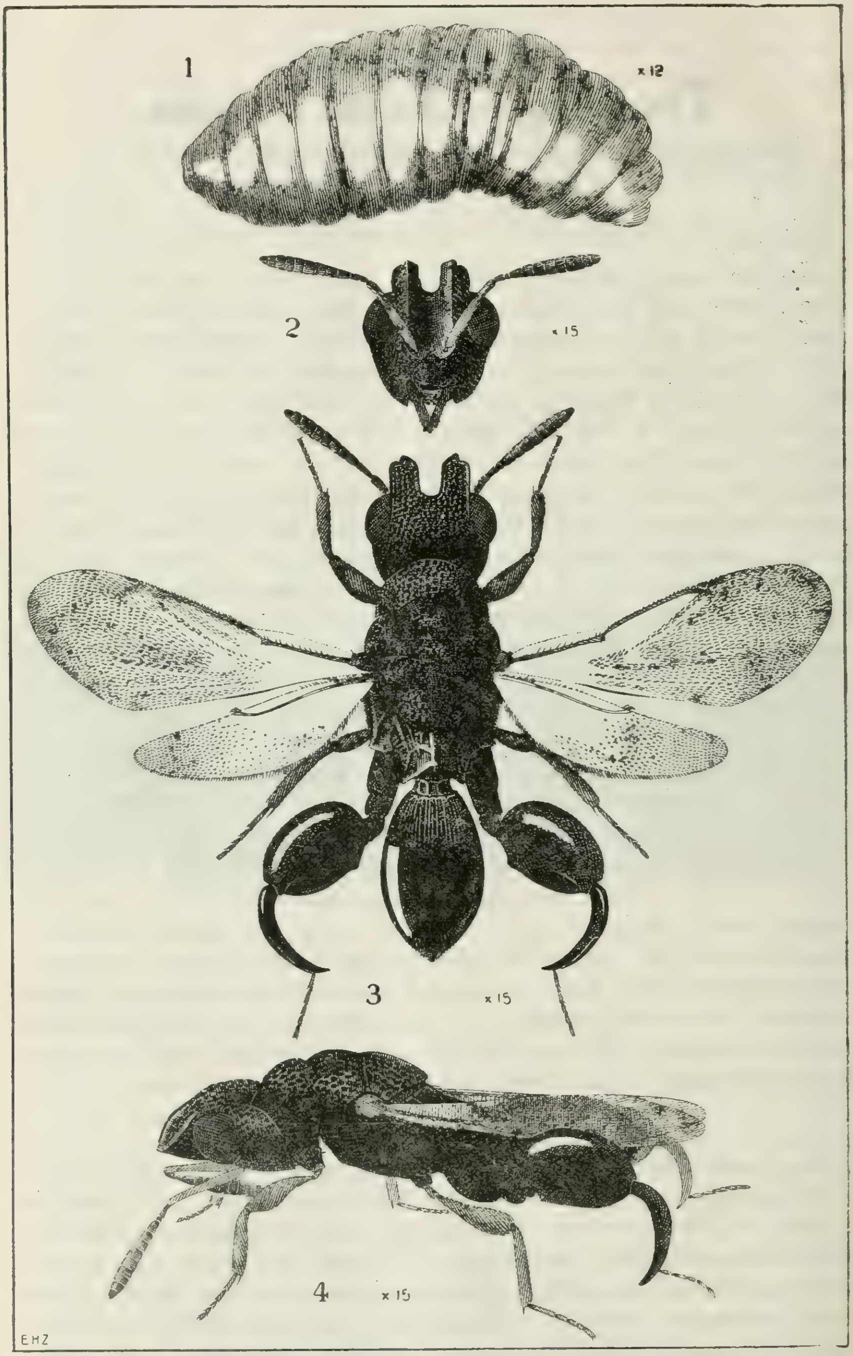
(*Dirrhinus sarcophagæ* n.sp. on *Sarcophaga aurifrons*).

W. W. FROGGATT, F.L.S., Government Entomologist.

Among the many interesting discoveries made during the investigations carried out at the Government Sheep Fly Experiment Station is that of a small chalcid wasp which burrows into the loose soil and deposits her eggs in the pupæ of the common flesh fly (*Sarcophaga aurifrons*). In point of numbers the genus *Dirrhinus* is a small one, eight species only having been previously described; but on account of their remarkable structure, interesting life history, and economic value, they have been carefully studied. Dalman (who created the genus *Dirrhinus*) described the type *D. excavata* from Africa, and it has since been recorded from Asia and India. Silvestri described and figured two species from Southern Nigeria (*Bulletin* 3, Division Entomology, Hawaii, 1914), which he recorded as parasites upon the pupæ of fruit flies in Africa. Dr. Silvestri found these parasites were very hardy and capable of living a long time without food, and he successfully introduced a number into the orchards in the Hawaiian Islands to fight the fruit flies. While engaged on the work of breeding chalcid wasps (*Nasonia brevicornis*) in our Experiment Station laboratory at Kooroogama, Moree, New South Wales, Mr. James McDonald discovered several of the Digger chalcid wasps (*Dirrhinus sarcophagæ*) emerging in the breeding cages from the smooth oval pupæ of the common flesh fly. A fine series was bred out one only from each fly pupa) between the first of January and the end of February, when specimens removed from the breeding cages and placed in glass tubes without food or attention lived for eighteen days. As the sarcophagid fly maggots do not, like the true blow-flies, pupate on the surface of the ground, but usually work their way down an inch or more into the loose soil beneath where they have been feeding, they are better protected from wandering parasitic enemies. The remarkable structure of the head and legs enables the Digger chalcid wasps to reach and parasitise the buried pupæ.

Description.

The general colour of this parasite is black, with antennæ, first two pairs of legs and the tarsi of the hind pair a light reddish-brown; the wings are hyaline with iridescent reflections, and the base dark, with the rest of the costal nervure a lighter reddish-brown. Viewed from above, the whole of the head, thorax, base of the abdomen and the hind legs are deeply and closely punctured, with the exception of the front margin of the central lobe of the mesothorax, which is smooth and finely shagreened. The whole of the punctured surface is clothed with rather long, scattered, spiny white



The Digger Chalcid Wasp (*Dirrhinus sarcophagæ*).

1 Larva or maggot from the pupa of the flesh fly (*Sarcophaga aurifrons*). 2. Head of Digger Chalcid Wasp, showing frontal cleft in head and antennæ 3. Dorsal view of Chalcid Wasp. 4. Side view of Chalcid Wasp.

hairs, finer on the under surface; the punctures on the swollen femora and tibiæ of the hind legs are finer than those on the body. The head is large and arcuate behind, with the centre in front deeply cleft, at the base of which are the long-elbowed cylindrical antennæ. The eyes (placed well down the side of the head) are large, circular, and projecting, with curious silvery markings. The thorax is not quite as broad as the head. The prothorax is narrow, with the central lobe of the mesothorax raised. There is a rounded projection at the apex of the scutellum with a blunt spine on either side, and the pointed, elongated mouth parts are turned backward to the base of the fore legs. The fore and middle pair of legs have the apical portion of the femora swollen; the tibiæ are rather short and stout and are furnished with a spine at the apex and the tarsi are long. The femora of the hind legs is large, swollen, and globular, and flattened on the sides with a cleft or furrow along the under side to receive the sickle-shaped tibia; the tarsi are long. The abdomen has a short basal stalk, coarsely punctured and striated. The basal third of the rest of the elongate oval abdomen is deeply and regularly striated with parallel ridges, with the apical portion smooth and shining on the dorsal surface and telescopic at the tip. The under surface is furrowed down the centre and the anal extremity pointed. Its length is 6 mm.

WHICH IS YOUR BEST COW?

WHEN guess-work is matched against the scales and the Babcock tester it comes a bad second. This was illustrated in New Zealand, where an official of the New Zealand Department of Agriculture related to a gathering of dairy farmers how, in order to show that dairymen do not know the respective merits of their cows, members of various New Zealand associations were a year or more ago asked to select their eight best cows and to place them in order of merit before the season's testing commenced.

One man placed a cow giving 140 lb. fat ahead of one producing 176 lb., a difference of £10 4s. Another man preferred a cow producing 289 lb. fat to one giving 507 lb., a difference of £16 7s. In a number of instances dairymen selected, as amongst their eight best, certain cows which they later on had to cull out. The mistakes that were made by almost every dairyman in this connection should satisfy dairy farmers that the taking of the weights and regular testing are essential to accurate knowledge of the individuals of the herd.

A HANDY BUSH-MADE TREE PULLER.

A USEFUL contrivance for pulling trees out can be made by a handy man out of a stout log mounted in a frame. The log is placed upright in a suitable frame so that it can revolve freely, and it is morticed right through at one end to take a lever. A cable is attached to the drum and the tree is pulled down by winding the drum with the lever. The end of the log forming the drum must be strengthened with an iron ring.—A. H. E. MCDONALD, Chief Inspector of Agriculture.

NEW SOUTH WALES WHEAT VARIETIES ABROAD.

SOME of the wheat varieties bred by the Department of Agriculture for growers in this State are justifying their selection very much farther afield. In acknowledging a supply of Hard Federation seed, the Agricultural Officer of the Department of Agriculture, North-West Frontier Province, India, writes: "I look forward with keen interest to comparing the new seed with that of Federation. . . . The chief objections raised by cultivators here against Federation are that the grain is soft, and the variety demands better cultivation and stronger land than their own wheat. Hard Federation will no doubt remove one of their objections to the variety. In my last letter I said Federation promised a great crop this harvest. The yield was 53 bushels per acre on 10 acres."

A FALLACY CONCERNING OATS.

FOR three seasons a Griffith farmer successfully grew Algerian oats, using no fresh seed, but obtaining good yields of satisfactory grain. This year he noticed that "the whisker on the end of the sheath, and in some cases the sheath itself, is discoloured," and inquired of the Department if this was a sign of deterioration and an indication that the oats will eventually become black oats.

"The sample of Algerian oats submitted does not show any sign of deteriorating in purity," the correspondent was informed. "Algerian oats generally show an awn on the end of the grain and in some seasons this becomes more pronounced; most of it will be removed in the threshing, and if that seed is sown the following year and if the season is normal, it will be found the crop will be true to character. A statement has been made on some occasions that Algerian oats will revert to black oats. Observations have been conducted by this Department for a number of years to ascertain if this is a fact, but nothing has been seen that tends to confirm the statement."

THE IMPORTANCE OF PURE SEED.

THE importance of pure seed cannot be overestimated. That by threshing his own seed wherever possible the farmer may often avert substantial loss, is illustrated in the following incident.

Last Good Friday a Wollongong farmer planted a quantity of alleged Algerian oats. The better the day, apparently, the worse the seed. Twenty per cent. of the crop showed Algerian oats, and the remaining 80 per cent. an intruder of doubtful utility. Reporting on a sample of the impurity, Mr. E. Breakwell, Agrostologist, wrote: "The grass is *Lolium temulentum*, commonly known as Drake or Darnel. It has been found that imported Tasmanian, Victorian, or New Zealand oats contain this impurity in large proportions. The grass is a fair dairying grass, but cannot be compared with the oats in this respect. It also possesses the disadvantage of the seed containing poisonous principles."

Inspection of Potatoes.

E. D. BUTLER, Officer in Charge of Exports and Imports.

THE value of the work done by the Department of Agriculture in connection with the potato-growing industry in New England has lately been the subject of some striking testimony from a number of local merchants and growers. The object of the inspection, when established some years ago, was the prevention of diseased potatoes from coming on the market, but it was also widely recognised that the quality of the potatoes and their grading and packing were capable of much improvement. Inspectors took advantage of their opportunities to advise and urge upon farmers the importance of better methods in the way of grading and packing, and a distinct change for the better has taken place. The result, in fact, has been described by one merchant as having "absolutely revolutionised the New England potato-growing industry."

A few years ago New England potatoes had a very indifferent reputation in Sydney and in other markets (such as Queensland), but to-day many lines bring higher prices than the produce of any other part of the State, and some growers, having secured a reputation for honest grading and packing, get prices almost, if not quite, as high as those obtained for the best Tasmanian and Victorian parcels. Moreover, New England potatoes are now receiving attention from Queensland buyers that they could not command in the past.

The recent transfer of the inspector at Guyra at the close of the potato season to another part of the State, became the opportunity for several Guyra produce merchants and some of the bigger growers (in all about sixteen or seventeen) to express their satisfaction with the system. Extracts from several of the letters follow :—

No. 1.—New England potatoes to-day command higher values than any other potatoes on the market, and we are quite convinced that this has been brought about by virtue of the inspection, as the buyers can now depend upon the quality of stuff sent them from this district. At the same time, however, we think the inspector's powers here are far too limited, and we would like to see him vested with the power to reject potatoes that are not suitably graded.

No. 2.—The value of inspection of potatoes is incalculable for the following reasons : —(1) It keeps diseases in check, and educates the farmer how to treat diseases. (2) It encourages production, and makes every farmer careful in classing his products. (3) It has brought our potatoes on to the market, and we can now get equal prices to Tasmanian. (4) Farmers are all of the opinion that if the inspection was discontinued we would not be able to sell our seed tubers so advantageously as we do now.

No. 3.—We are inclined to believe our potatoes now compare fovourably with any in the State, and we are afraid if the inspection was taken away some of our farmers may have a tendency to become careless, which would lower the standard of our products and hamper the efforts of our more careful men. We believe, given a good season, our potatoes would equal any from Tasmania. *if graded*, and this is a matter we would be pleased to see within the jurisdiction of the inspector.

No. 4.—Inspection every time for me. Potatoes should be inspected, not only here but in other districts as well.

No. 5.—We can grow as good potatoes in this Guyra district as can be grown in any part of the Commonwealth, provided the farmers take the trouble to make a good sample.

No. 6.—The class of potato that we raise here is equal to anything that can be produced in the world, and if we could get the farmer to grade his potato in the proper manner we would compete with Tasmania and other places. I would like to see the Department take this matter up and enforce the farmers to make a good grade.

No. 7.—I am prepared to make the following sworn statement, viz.—That since the inspection of tubers came into force, no district in the whole of New South Wales has received better consideration from the large buyers, *and no farmers anywhere in the State have received a better remuneration than those of Guyra for their production.*

No. 8.—I unhesitatingly say it would be most detrimental to the trade here if the inspector were withdrawn; in fact, I go further and would suggest that he be given the extended power of grading, as I am firmly convinced that such power would result in our potatoes being held in still higher estimation by the purchasers, especially in Queensland, which is our natural market.

The correspondence has not only shown that the inspection has been successful in the desired direction, but it has served to indicate the ways in which further improvement and development might take place. New South Wales has still to import more than half the potatoes consumed in the State, and until improved methods of growing and marketing have resulted in potatoes of better and more even quality and attractive appearance coming forward the growers' returns must suffer in comparison with those of States where a higher standard is attained. There is no reason, however, why this State should not produce the whole of its requirements, and of quite equal quality to anything that could be imported; but this can only be achieved by the extension of the powers of the Department.

Such larger powers are possessed by the Departments in Victoria and Tasmania, and in Canada the law empowers the inspectors to insist that "the specimens shall be sound, practically free from dirt or other foreign matter, frost injury, sunburn, second growth, cuts, scab, blight, dry rot, and damage caused by disease, insects, or mechanical means." With such powers, beneficently administered, much, indeed, could be done for the advancement of the industry within New South Wales.

THE WORKER'S SHARE.

THE worker's share in agriculture consists not only of the supply of labour and skill in the actual performance of farming operations, but oftentimes includes the contribution of knowledge and experience to the management of the farm. In such cases there is a real co-operation between employer and worker to wrest from nature the utmost of which the land is capable. The worker's share in agriculture, and his position in the industry, will be determined in the long run by the general spirit of the relationship which exists between him and his employer, rather than by the precise definition of the terms of the relationship. Mutual respect, and confidence, and consideration cannot be defined, but it is in the cultivation of these qualities that the best outlook for the future lies, and where they exist there will be real co-operation for the promotion of the best interests of all engaged in the cultivation of the land.—Sir HENRY REW, K.C.B., in *The Journal of the Board of Agriculture* (England).

New Varieties that are Popularising Oats.

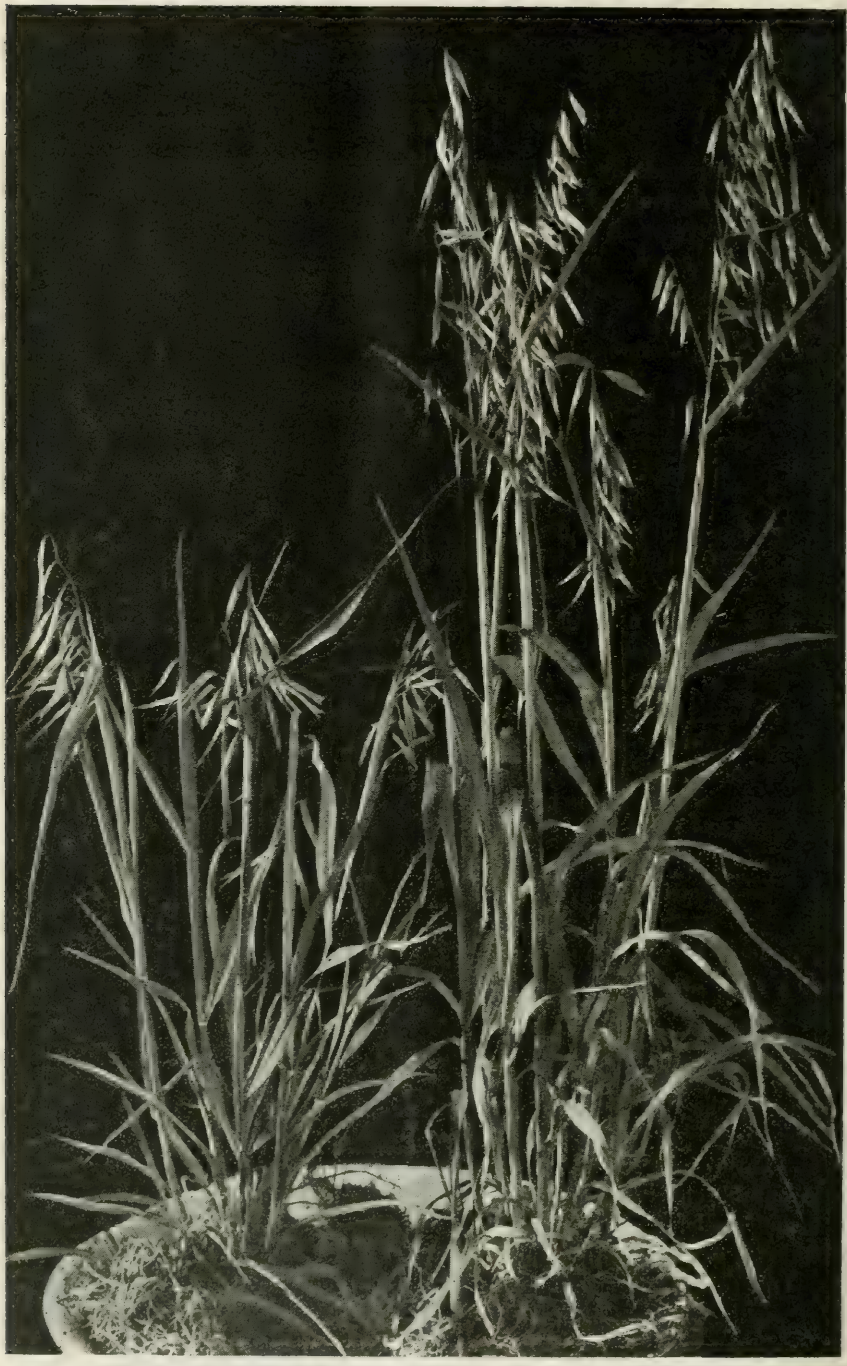
A. H. E. McDONALD, Chief Inspector of Agriculture.

THE advances made by the Department of Agriculture during the past few years in the production of oats are comparable with the success attained in raising varieties of wheat suited to our various climatic conditions. A few years ago the only oat available for any but the cool tableland districts was Algerian, and even this was not altogether satisfactory. Encouraged, however, by the results obtained in crossing and selecting wheats, similar work was undertaken with oats and the potentialities of the crop developed so favourably that a number of new varieties have been originated. A few have been established in character and have been tested in farmers' experiment plots, while some are still in process of selection for the fixing of the type. Three varieties have been given extensive trials—Lachlan, Guyra, and Sunrise. In each of these there is evidenced a general superiority to Algerian.

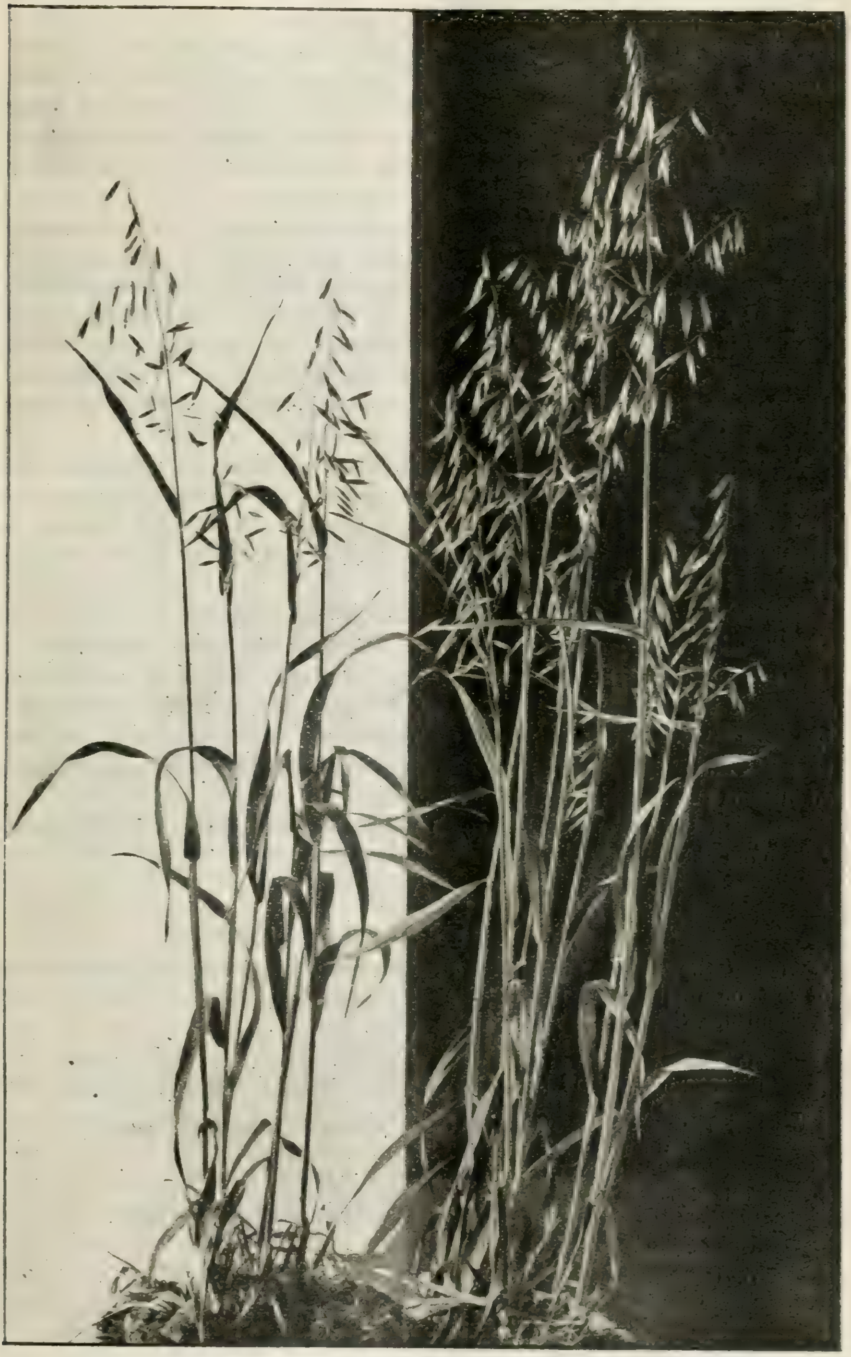
Sunrise is an early maturing variety, and has given good yields in the further western districts. At Trangie Experiment Farm last year, under unfavourable climatic conditions, it made a splendid growth and provided a good cut of fine hay. The yield compared very favourably with that obtained from Florence and other early maturing wheats. In company with other new varieties of oats,

Lachlan oats (green stage) at Cowra.

A Cowra farmer has, this season, cut 1 ton of hay per acre from his Algerian, and 35 cwt. per acre from Lachlan, which is a half-sister to Guyra.



Typical Oat Plants at Cowra Women's Training Farm.
Algerian oats on the left, sown the same day as Guyra on the right. In a dry year the Algerian will hardly give enough length of straw to cut for hay, though the crop is heavy in a good year.



Typical Oat Plants at Cowra Women's Training Farm.

Sunrise on the left, Cowra No. 22 on the right. The latter is a selection or sport from the New Zealand oat Ruakura; it has taller and stronger straw than that variety, though it stools less.

Sunrise has become very popular with farmers on the coast for supplying early winter green feed, and an active demand exists for seed. Coastal farmers previously depended upon late-sown sorghum to provide them with feed during the early winter months, but in many places sorghum is being replaced by oats for this purpose. Depreciation of the quality of the sorghum by the red-stain disease has been one of the causes leading to the utilisation in this part of the State of these early maturing oats.

The present unfavourable season is bringing the new oats into especial prominence. At Temora Experiment Farm, Lachlan and Guyra oats have made very satisfactory growth considering the conditions, and were markedly ahead of Algerian sown at the same time in the season. A disadvantage of some of these new oats—particularly Lachlan—is the long tail, which interferes with its even sowing through the wheat drill. A grading and finishing machine that will remove this objectionable feature by dressing the oats, is being installed at Cowra Experiment Farm.

At Wagga Experiment Farm the experience has been much the same, the growth of Sunrise and Lachlan and other new crossbreds being much superior to that of Algerian, and the Manager is of opinion that, though Algerian is suitable under favourable conditions, better average results will be obtained by sowing the early maturing varieties.

The success attained by the Department in the raising of oats suitable for all the districts in which wheat is grown is of very great importance to farmers, providing, as it does, a change of crop which is of considerable assistance in combating take-all. The sowing of oats in rotation with wheat has been recognised as a means of overcoming this disease, and the new varieties under discussion promise to produce profitable yields under climatic conditions unfavourable to the older ones.

The plants in the acccompanying photographs were grown in Mr. Pridham's field plots at Cowra, and lifted for the photographer.

SOME RECENT PUBLICATIONS.

COPIES of the undermentioned publications may be obtained by farmers free of cost, on application to the Under Secretary and Director, Department of Agriculture, Sydney :—

FARMERS' BULLETINS.

119. The Peanut, 39 pages ; by W. D. Kerle.
126. Sudan Grass, 17 pages ; by E. Breakwell (with "Sudan Grass under Irrigation," by G. G. St. Clair Potts).
127. The Testing of Pure-bred Cows in N.S.W. (No. 2), 21 pages ; by L. T. MacInnes.

MISCELLANEOUS PUBLICATIONS AND LEAFLETS.

Early Tomatoes at Hawkesbury Agricultural College.
Tobacco : the Production of Light-coloured Pipe and Cigarette Leaf.
Poison Baits for Fruit Flies, &c.
Fertiliser Mixtures for the Orchard.
The Cultivation of Boree Country.
The Identification of the Varieties of Wheat.
Notes on the F.A.Q. Wheat Sample (1918–19 Harvest).
The Fowl Tick.
The Insect Pests of Maize.
Notes on Some Common Ailments in Farm Stock.

Farmers' Experiment Plots.

MAIZE EXPERIMENTS, 1918–19.

South Coast District.

R. N. MAKIN, Inspector of Agriculture.

VARIETY trials with maize for grain and green fodder purposes, also tests with different artificial manures on grain and green fodder varieties, were planted during the past season on the South Coast, the following farmers co-operating with the Department in the work :—

J. Hansen, Moruya.
J. H. Martin, Pambula.
J. Chittick, Kangaroo Valley.
J. Timbs, Albion Park.
O. Phillips, Moss Vale.
D. Shepherd, Milton.
L. B. Garrad, Milton.
Superintendent, Boys' Farm Homes, Mittagong.

The season proved one of the worst experienced for many years, the summer being exceptionally dry, as instanced by Moruya, where the rainfall from 1st September, 1918, to 26th February, 1919, totalled 472 points, of which the heaviest fall recorded was 73 points. On 27th February a fall of 1,445 points fell, which did an immense amount of damage to crops. In the Bega district the rain at this time was even heavier, causing one of the biggest floods ever known in the district and completely ruining the maize crops. At Pambula the plots were under flood waters, and the returns from these plots shown below are those from any undamaged maize that could be found after the flood on what had been a very promising crop. Owing to the dry summer conditions, the plots failed at Albion Park and Moss Vale, while at Kangaroo Valley most of the early maturing varieties failed to cob and were cut out and fed to the cows.

Results with Grain.

The best returns in the grain section came from Mr. Hansen's plot at Moruya. The position—on a flat which until lately was the Show Ground, near the river—was a factor largely helping in the satisfactory returns. As will be noticed in the returns in the manurial sections, the ground was rich, and owing to the dry weather conditions the manures really did more harm than good. This plot was sown 25th September, 1918, and harvested 18th June, 1919, the effective rainfall being 1,917 points. The season was altogether unfavourable for the early maturing varieties, as they cobbed in the height of the dry weather. On this plot Funk's Yellow Dent put up a remarkable performance by yielding 86 bushels per acre of excellent grain, and coming in months ahead of Red Hogan and other later maturing varieties. On this same plot farmers' varieties were again very successful, the later maturing sorts yielding the best. Mr. Louttit's Moruya Yellow was a very nice sample of corn, as was also Mr. Jeffery's Hickory King.

RESULTS of Variety Trials for Grain.

Variety.	J. Hansen, Moruya.	J. H. Martin, Pambula.	J. Chittick, Kangaroo Valley.
	Bushels per acre.	Bushels per acre.	Bushels per acre.
Silvermine...	51·24	56·00	......
Leaming	83·32	63·00	......
Funk's Yellow Dent	86·44	36·42	34·28
Red Hogan	97·40	38·28	34·40
Hickory King	59·20	42·00	......
Boone County	72·15	59·28	......
Improved Yellow Dent	80·40	49·00	36·36

TRIAL of Farmers' Varieties at Moruya.

Farmer.	Variety.	Bushels per acre.
A. Louttit ...	Moruya Yellow	92·33
A. Louttit ...	Improved Goldmine	67·22
A. Louttit ...	Goldmine	67·24
S. Louttit ...	Silvermine	84·32
H. Jeffery ...	Hickory King	82·16
H. Jeffery ...	Funk's Yellow Dent	85·40
H. W. Luck ...	Silvermine	91·24
J. Hansen ...	Funk's Yellow Dent	86·48

RESULTS of Manurial Trials for Grain.

Manure per acre.	J. Hansen, Moruya.	J. H. Martin, Pambula.	J. Chittick, Kangaroo Valley.	D. Shepherd, Milton.	L. Garrad, Milton.
	Bushels per acre.	Bushels per acre.	Bushels per acre.	Bushels per acre.	Bushels per acre.
P7,* 2 cwt.	80·40	49	36·36	35·38	20·00
Blood and bone, 2 cwt...	79·40	......	......	38·44	29·16
M5,* 1½ cwt.	75·12	......	34·52	......	28·32
No manure	87·24	35	33·24	31·51	22·48
P8,* 2 cwt.	83·32	......	......	37·24	27·40
Superphosphate, 2 cwt.	76·28	63	35·80	39·11	16·24

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* The following is the composition of the mixed fertilisers used:—M5, 2 parts superphosphate and 1 part sulphate of ammonia; P7, equal parts of superphosphate and bonedust: P8, equal parts of superphosphate and blood and bone.

The poor returns from the Pambula plots are due to the flooding they received. In spite of the dry weather and no doubt due to the careful attention they got, all the varieties were most promising; here also a number of farmers' varieties were all entirely destroyed in the flood.

At Kangaroo Valley the plots were sown 9th October, 1918, and harvested 3rd June, 1919, the total effective rainfall being 610 points. Only the later maturing varieties and Funk's Yellow Dent did any good; the latter appears to stand dry weather conditions in a remarkable way for an early maize.

The plots at Milton on Mr. Garrad's farm were sown 15th October, 1918, and harvested 26th June, 1919, but owing to the dry weather conditions the returns are poor compared with those of last year. The plots on Mr. D. Shepherd's farm at Milton were sown by Mr. H. Wenholz, Inspector of Agriculture, with Gold Standard Leaming; at Mr. Garrad's (about half a mile distant) the variety used was Improved Yellow Dent. On Mr. Shepherd's farm the plot was on an alluvial flat, and on Mr. Garrad's on a sandy hillside. The manures had a better effect on the former plot owing, no doubt, to there being more moisture in the flat ground.

Results with Green Fodder.

In the green fodder section the returns are fair, considering the season. The Unanderra plot was sown 19th November, 1918, and harvested 24th April, 1919. Very little rain fell until the end of February, when the stunted plants made rapid growth. In this plot the ground was very uneven and a soakage was apparent which was no doubt responsible for the good yield from the plot treated with P8 manure. These plots were sown with the wheat drill in rows, 2 feet between the rows and with about 30 lb. seed per acre. The manure was distributed by the machine at about 120 lb. per acre.

RESULTS of Manurial Trials for Green Fodder.

Manure.	C. L. Lindsay, Unanderra.				Boys' Farm Homes, Mittagong.			
	Yield per acre.				Yield per acre.			
	t.	c.	q.	lb.	t.	c.	q.	lb.
Superphosphate	13	1	1	20	9	0	0	0
Blood and bone	13	14	1	4	13	11	1	20
M5	11	8	2	8	10	5	2	24
No manure	13	11	1	20	6	10	0	0
P8	23	2	3	12	10	10	0	0
P7	17	5	2	24	9	7	0	16

FODDER Variety Trial at Mittagong.

Variety.	Yield per acre.			
	t.	c.	q.	lb.
Hickory King	12	10	0	0
Leaming	11	2	3	12
Improved Yellow Dent ...	9	0	0	0

At Mittagong the plots were sown 10th October, 1918, cut 27th March, 1919, and put in the silo. The ground here is very poor and manures never fail to leave their mark. On these plots a test with several varieties suitable for fodder showed Hickory King as superior to others tried. For poor ground Hickory King is undoubtedly a good variety and can be recommended for the Mittagong district, though it is doubtful if it will retain the sap in the stem as long as Improved Yellow Dent.

Upper North Coast.

W. D. KERLE, Assistant Inspector of Agriculture.

Co-operative maize experiments were sown by twelve farmers in the Upper North Coast district during the 1918–19 season, but owing to the exceptionally adverse weather conditions the crop failed in 50 per cent. of the tests. The farmers who were fortunate in being in localities where the rainfall was less meagre, and whose crops gave results worthy of publication, were:—

Ernest Green, The Risk, Kyogle.
Henry Short, Dorrigo.
Frank Allard, Brooklana, Eastern Dorrigo.
Geo. Forrest, Coraki.
E. J. Raymond, Thora, Bellingen.
E. N. McKinnon, Lawrence.

The Season.

The spring of 1918 opened exceptionally dry in this district generally, and continued so into the summer of 1919. March saw the breaking of the drought with a fall for the month of 8·77 inches at Grafton, 21·17 inches at Bellingen, 20·92 inches at Dorrigo, and correspondingly heavy falls in the other localities. The succeeding two months were excessively wet, and were followed by a winter even drier than the summer. With such an erratic precipitation—the months of heavy rainfall coming much too late to be of benefit to the crops—it is not to be wondered that many maize crops failed, and high yields were few and far between.

The Bellingen district and the Dorrigo plateau (in close proximity) had a much more favourable season than the northern portion of the district. The rainfall in January and February—critical months for the early sown crops—averaged 4 inches as against $1\frac{1}{4}$ inches in the Clarence and Richmond districts. At Kyogle, also, good falls at the tasselling period were responsible for satisfactory yields being obtained.

Through the district generally, the constant rain since March caused a dense growth of weeds in the cultivation paddocks, particularly of the so-called "wild gooseberry," which in many cases reached from 8 to 9 feet in height, and which it was impossible to check.

The results of the experiments are contained in the accompanying tables.

TABLE A.—Variety Trial.

—	Kyogle.	Dorrigo	Brooklana.	Coraki.	Bellingen.
Date of Sowing.	Nov. 11, 1918.	Nov. 5, 1918.	Dec. 23, 1918.	Oct. 6, 1918.	Nov. 12, 1918.
	bush.	bush.	bush.	bush.	bush.
Leaming	62	43	52	46	41½
Improved Yellow Dent ...	60½	40	44	51½	61
Red Hogan	63½	...	...	...	44½
Golden Nugget	53½	37½	...	38½	25
Giant White	52	42	40½	...	27½
Silvermine	...	40½	...	25½	...
Hickory King	...	...	...	18	...
Large Macleay Yellow ...	...	...	...	...	35
Yellow Horsetooth	57	...	...	...	32
Gold Standard Leaming ...	...	...	...	47¼	...
Goldmine	...	...	...	34¾	...
Golden Beauty	...	...	...	39¼	...
Leggett's Pride	...	34½	...	44	...
Funk's Yellow Dent	46	...	...	41	...
Narrow Red Hogan	...	...	...	...	51½
Yellow Moruya...	41½	...	...	...	45
Yellow Mastodon	...	...	...	..	43
Golden Superb	...	52	...	...	36
Golden Drop	...	...	...	...	23
Craig Mitchell	...	...	..	...	22
Golden Glow	...	...	40½	...	...
Boone County White	...	28½	33	...	...
Brewer's Yellow Dent	...	...	38½	...	...
James' ,, ,, ...	...	...	35	...	...

TABLE B.—Manurial Trial.

—	Kyogle.	Dorrigo.	Brooklana.	Bellingen.	Lawrence.
Date of Sowing.	Nov. 11, 1918.	Nov. 5, 1918.	Dec. 23, 1918.	Nov. 12, 1918.	Jan. 3, 1919.
Effective Rainfall.	14·00 in.	11·86 in.	14·31 in.	16·70 in.	15·53 in.
Variety Used.	Improved Yellow Dent.	Leaming.	Leaming.	Improved Yellow Dent.	Improved Yellow Dent.
	bush.	bush.	bush.	bush.	bush.
Superphosphate 1 cwt. per acre	68½	47½	57	53	57¾
,, 2 ,, ,,	63½	39	76	61	58½
P7, 2 cwt. per acre	66½	42½	83	57	54
P8, 2 ,, ,, ...	60	47½	61½	52½	48½
M5, 1½ ,, ,, ...	61	42	65	50½	50
B. and B., 2 cwt. per acre ...	58½	43	68	47	50
No manure	57	34	41	43½	48
Superphosphate 1 cwt., and nitrate of soda ½ cwt. ...	......	36½	... ..	......	61

The fertiliser mixtures are made up as follows :—P7 = superphosphate 1 part, and bonedust 1 part ; P8 = superphosphate 1 part, and blood and bone 1 part ; M5 = superphosphate 2 parts, and sulphate of ammonia 1 part ; B. and B. = blood and bone

Cultural Notes and Comments.

Dorrigo.—The experiments at Dorrigo were conducted on red volcanic soil of a free working nature, and typical of the farming lands of the plateau. It was broken up in the winter of 1918, and harrowed several times before being reploughed, just prior to sowing on the 5th November. The seed was dropped by hand, three grains every 4 feet, the rows being 4 feet apart. The germination of all plots was excellent, and the young growth was sustained by a precipitation of 484 points of rain from date of sowing to the end of December.

On account of its elevation and correspondingly short growing season, the Dorrigo cannot compete with the alluvial coastal flats in maize growing, but very satisfactory yields can be obtained by the use of early maturing varieties. This has been demonstrated in the present trials (as in the past), the leading variety—Golden Superb—being an early maturing variety from the Macleay River. Leaming, the standard variety for early sowing on the coast, also does well in this locality. It is interesting to note the increased yields resulting from the use of artificial fertilisers. This was hardly to be expected from the rich, newly-cultivated soils of the plateau.

The maize trials on the Dorrigo have not been conducted for a sufficiently long period to allow conclusive recommendations to be made. Local farmers should note, however, the behaviour of varieties, particularly the early maturing kinds, and that the application of fertilisers, chiefly superphosphate, results in largely increased yields.

Kyogle.—The sowing of these plots took place on 18th November, on the rich alluvial soil which typifies the agricultural lands on the banks of O'Grady Creek. This tributary of the Upper Richmond enters the river at The Risk, 16 miles above Kyogle, and is the centre of an exceedingly fertile locality. Here the season was much more favourable than on the coast generally, the rugged nature of the country, no doubt, causing the greater precipitation. It was, however, by no means a good season, as the yields indicate, although a yield of 68½ bushels was obtained in the manurial trial with Improved Yellow Dent.

The varieties test would seem to indicate that mid-season and late varieties will give the best yields of grain. Red Hogan has given the highest return this season in this trial, but it is possible that Improved Yellow Dent and Leaming, the varieties recommended for the coast generally, will give the best results in an average season. Further experiments will be necessary before definite recommendations can be made with any degree of certainty.

The manurial trial with Improved Yellow Dent gave excellent results, and all plots receiving artificial fertiliser gave increases over the unmanured plot. The increase of 11½ bushels per acre for 1 cwt. of superphosphate per acre is a very payable one, which local farmers should note and take advantage of.

Brooklana.—The elevation here is 1,000 feet lower than the Dorrigo, for it lies midway between Coramba and the plateau. The soil is a light reddish volcanic loam similar to the Dorrigo, but possibly less productive. The maize was sown on 23rd December, in drills 4 feet apart, and the germination in all plots was very satisfactory. The crop was not harvested until June, and the rainfall recorded from sowing to harvesting was 45·60 inches, much of which was detrimental rather than beneficial to the crop.

In the trial of varieties, Leaming has given the best results, which is consistent with previous years' experiments. Golden Glow was tried for the first time this season and gave excellent results ; it is an exceptionally early variety, recently imported from America, and should prove of much value, particularly when acclimatised, in this and similar elevated districts where the growing season is short.

The manurial trial with Leaming gave exceedingly good returns ; in fact, rarely do the effects of fertilisers show out so clearly as in this experiment. The unmanured plot yielded 10 bushels per acre less than the worst manured plot (superphosphate, 1 cwt. per acre), and 36 bushels less than the best (P7, 2 cwt. per acre) ; but although these results seem almost conclusive, it should be remembered that the application of fertilisers to all crops is often attended with very variable results, the incidence of the season and the physical condition of the soil being the main contributing factors. Only after a series of years of careful experimentation can recommendations be made with certainty.

Coraki.—The soil on which these plots were sown was a low-lying alluvial, similar to a large area around Coraki. The sowing was made on 6th October, 1918, in drills, 4 feet apart and 8 chains long, the area of each plot being approximately one-fifth acre. The land was deeply ploughed during the winter months and again before sowing, the surface being kept well stirred with the harrows in the meantime. This thorough cultivation and care of the growing crop was of inestimable benefit, for the season was an exceptionally adverse one, the rainfall recorded during the growth of the crop being only 2·5 inches. Fortunately, 1·25 inches of this fell at the tasselling period, or it is doubtful whether the crop would have been worth harvesting.

It will be noted that Improved Yellow Dent and Leaming, the two varieties which have been recommended by the Department for this district for some time, have again proved their suitability, even in a season that was probably one of the worst in the history of the district.

Bellingen.—These plots were sown at Thora, at the foot of the Dorrigo, on moderately light alluvial soil, typical of the Bellingen river flats. Sowing took place on 12th November, the soil being in good condition, having been reduced to a fine tilth by a winter ploughing, several harrowings, and a further ploughing in early November, just prior to sowing. The drills were 4½ feet apart, and the seed was dropped by hand. The season in the Bellingen district was much less severe than along the rest of the Upper North Coast. The rainfall recorded from sowing to harvesting was 56·22 inches, distributed as follows:—November, 363 points; December, 164 points; January, 528 points; February, 245 points; March, 2,117 points; April, 749 points; May, 1,223 points; June, 233 points. The downpours of the autumn months did a great deal more harm than good to the crop, causing considerable mouldiness in the ear and promoting excessive weed growth which could not be checked. The crop suffered, too, from the depredations of cockatoos.

From a study of the yields, it is very apparent that the late and medium-late maize varieties are best adapted to the climate and soil of the district. Improved Yellow Dent has been recommended as the best main crop variety on the coast, and the results of this trial seem to indicate its particular applicability to the Bellingen district. In the manurial trial, superphosphate at 2 cwt. per acre gave an increased yield of 17½ bushels per acre over no manure. As this means a monetary increase of £2 to £3 per acre, its value is undeniable. Much useful information can be gleaned from a study of the yields in both trials, and farmers are recommended to use the results as a guide to a choice of varieties or fertiliser treatment.

Lawrence.—The trial at Lawrence was confined to a comparative test of fertilisers, and was sown late in the season (3rd January, 1919), Improved Yellow Dent being the variety chosen. Each plot occupied one quarter of an acre, and was sown in drills 4 feet 6 inches apart, the fertilisers being dropped by hand. The soil is a light loam of only medium quality, and typical of a large area of land that lies back from the rich alluvial soils on the banks of the Clarence. It is a free working soil, capable of producing high yields with good soil cultivation and the addition of artificial fertilisers. The ground at sowing time was dry, but sufficient moisture was present to produce a satisfactory germination. The ground had been thoroughly worked and brought to a fine tilth.

In the first two months after sowing, only 2·5 inches of rain fell, but the dry conditions gave place to exceptionally wet ones in March, when 8·77 inches of rain was recorded. The experiment was not harvested until 20th June, owing to the lateness and wetness of the season. Actually 22 inches of rain fell on the crop, but a great deal of this proved harmful, causing excessive weed growth and producing a high percentage of mouldiness in the ear. The most successful plot in the trial proved to be that treated with superphosphate at 1 cwt. per acre, at the time of sowing, and a top dressing with ½ cwt. per acre nitrate of soda six weeks after germination. This increase has scarcely been sufficient to pay for the high cost of the latter fertiliser, and its application is not recommended until further trials have been made.

The result of this trial in general is still another argument in favour of the application of artificial fertilisers. It can almost with safety be said that the success of artificial manures is now practically beyond the experimental stage in this and similar districts. Farmers are recommended to profit by the results of the experiments, which are conducted by the Department for their particular benefit, and to use those fertilisers that have been proved by experiment to be the best for their district. In general it might be said that superphosphate alone, or mixed in equal quantities with bonedust and applied at the rate of 2 cwt. per acre, will give highly payable results in average seasons.

Murrumbidgee Irrigation Areas.

G. G. St. CLAIR POTTS, H.D.A., H.D.D., Assistant Inspector of Agriculture.

MAIZE variety and manurial trials were conducted during the past season with the co-operation of the following settlers:—

P. Gersbach, Farm 330, Leeton.
A. E. R. Tiffen, Farm 319, Leeton.
E. H. Ronfeldt, Farm 797, Leeton.
F. M. Young, Farm 148, Leeton.
I. Dixon, Farm 543, Leeton.
H. S. Clark, Farm 159, Leeton.
J. McCausland, Farm 333, Leeton.
P. Davidson, Farm 883, Whitton.
R. A. Hews, Farm 853, Whitton.
F. W. Hopley, Farm 315, Leeton.

Stud seed plots of maize were also established at two centres (the farms of Mr. P. Gersbach and Mr. H. Black, Farm 53, Leeton), the former growing United States No. 133, and the latter the crossbred Silvermine x Funk's Yellow Dent.

Owing to erratic germination on Farm 315 and the presence of self-sown sorghum on Farm 853, comparative yields were unobtainable at those centres.

The experiments were conducted on various types of soil, and it will be found interesting to follow the behaviour of varieties in this connection. The outstanding feature of the experiments is the consistent yield of Silvermine and Funk's Yellow Dent, two varieties recommended by the Department for the irrigation areas. Disease was present to a small degree only, dry rot (*Fusarium* sp.), being noticed at a few centres. Ear-worm (*Chloridea obsoleta*) was manifest slightly during the latter part of the season, but caused little damage.

The Season.

Strong drying winds throughout the summer months were much in evidence and continued till the second week in February, at which period most of the varieties in the plots were tasselling. As a result the fertilisation of the grain was checked considerably and the yields suffered. Even though sowing was conducted during December, it had not the desired effect, and the natural precipitation being extremely low and evaporation high, irrigation had to be constant.

Rainfall.—September, 38 points; November, 7 points; December, 31 points; January, 13 points; February, 80 points; March, 72 points; April, 131 points; May, 163 points. Total, 609 points.

Evaporation from a water surface.—September, 3·116 inches; October, 5·458 inches; November, 9·354 inches; December, 10·74 inches; January, 11·026 inches; February, 6·766 inches; March, 5·645 inches; April, 3·310 inches; May, 2·007 inches. Total, 57·422 inches.

The Plots.

Farm 330.—Sown on 23rd September in red sandy soil; germination weak, due to rapid evaporation of soil moisture. The practices of irrigating prior to seeding and of using a maize dropper were not adopted. Satisfactory growth was maintained throughout the season, but hot winds interfered considerably with fertilisation, and in consequence disappointing yields were obtained. Sowing as early as September is not recommended on account of the prevalence of hot winds during tasselling. The performance of Leggett's Pride (a new variety to the district) is creditable, whilst Funk's Yellow Dent also gave a good comparative yield.

Cultural details.—Previous crop, maize, 1917; ploughed in August, harrowed, levelled with smoother, and harrowed again in September. Irrigated during growth on 9th November; 2nd and 17th December; 1st, 16th, and 31st January; 15th February; 1st March. Inter-row cultivated on 8th and 13th November; hilled on 10th December; harvested 21st March. Rainfall, 277 points.

The stud seed plot of United States No. 133, was sown 24th December in red sandy soil. An excellent germination was obtained, and the crop made rapid strides in growth, the stalks averaging 7 feet high, with a few plants ripe eighty-seven days after planting. The husk covering is very weak, but this will be eliminated by selection. Harvesting took place on 8th May, the crop ripening in sixteen weeks, and returning 50 bush. 20 lb. of grain per acre. This variety appears very promising for the district. Its early maturing qualities will allow of sowing operations being conducted at a later date with less chance of bad effects from hot winds during tasselling. The grain is of a bright golden colour, plump, and of excellent quality.

Farm 797.—This experiment was sown 7th to 9th December in grey to red clay loam, well supplied with moisture, and in excellent condition. The seed germinated smartly, and subsequent growth was most promising. Every possible attention was given to the plots throughout the season, but unfortunately the prospects of high yields were frustrated by two hot windy days in the middle of February. These caught the crop during tasselling, and it was estimated that the yield suffered to the extent of 50 per cent. The yield of Brewer's Yellow Dent is creditable. This variety resembles Funk's Yellow Dent, maturing at the same period. It carries comparatively large ears, containing attractive broad yellow plump grain. Funk's Yellow Dent also yielded comparatively well.

Cultural details.—Previous crop, wheat, 1917; ploughed in March, 1918; fallowed; harrowed in August; ploughed and harrowed in September; irrigated 27th November; spring-tooth cultivated and harrowed twice, 4th December. Irrigated during growth on 17th January; 2nd and 19th February; 4th March; 14th and 30th April. Inter-row cultivated during growth on 18th and 28th December; 21st January; 7th and 26th February; 12th March; hilled lightly with plough on 28th February, and again on 10th March; plots manured with 2 cwt. superphosphate per acre; harvested 1st to 15th June. Effective rainfall, 478 points.

Farm 148.—At this centre the experiment was sown on 10th December, the soil being a heavy red clay in fairly good condition. A satisfactory germination was obtained, and subsequent growth indicated good returns.

The hot winds again caused much damage. The crossbred Silvermine x Funk's Yellow Dent yielded promisingly, but Silvermine topped the list. Nubbin ears were prevalent in Early Yellow Dent, and in consequence the shelling percentage was as low as 70. The yields cannot be regarded as profitable for normal seasons, but with later sowings, more inter-row cultivation, and the adoption of early maturing varieties, these could be improved upon.

Cultural details.—Previous crop, maize and pumpkins, 1917; ploughed August, 1918; cultivated and fallowed; cultivated with rigid tooth in November; irrigated, 3rd December; cultivated and harrowed, 9th December; harrowed on 10th December. Irrigated during growth, 15th January, 15th February, and 12th March; cultivated on 30th December and 14th January; plots manured with 2 cwt. superphosphate per acre; harvested 25th June to 3rd July. Effective rainfall, 315 points.

Farm 543.—Sowing operations were conducted in a heavy red clay loam, without manure, on 12th December, in rows 4½ feet apart, the seed being hand-dropped in damp furrows and covered with the tine harrows. An erratic germination followed, and with the hope of promoting a better strike the land was flood irrigated, with the usual disappointing results. The practice of hand-dropping seed in this way is not advocated, as there is no provision made for soil compaction around the seed, which appears essential for a satisfactory germination. Growth throughout the season was disappointing, and detrimental effects were noticed from a fall of rain in February following immediately upon a heavy irrigation.

Little difference could be noted in the varieties under trial. Funk's Yellow Dent (stud seed) returned 3 bushels per acre increase above the bulk seed. This illustrates to a small degree the value of seed selection, but with normal conditions it is confidently anticipated that a greater difference will be obtained in favour of selected or stud seed.

Cultural details.—Previous crop, wheat, 1918; land irrigated, 5th December; ploughed and harrowed, 11th December; irrigated in furrows. Cultivated during growth on 22nd December, 7th and 22nd January, 5th February; irrigated on 19th December, 3rd and 18th January, 2nd and 17th February; harvested 13th to 15th June, 1919. Effective rainfall, 315 points.

Farm 159.—These plots were sown on 27th and 28th December, the soil being loamy in character and ranging from red to grey in colour. The germination was weak and subsequent growth most disappointing, the former being due to lack of soil compaction around the seed, and the latter being attributed to faulty irrigation and lack of inter-row cultivation. Towards the ripening stages the crop was considerably damaged by parrots, and comparative yields were difficult to obtain. Funk's Yellow Dent and Gold Standard Leaming were the most promising varieties under trial. Canada Early Flint matured in fifteen weeks, and produced two to three cobs per stalk, but the grain set badly, and many of the ears failed to reach maturity. Brazilian White, a late maturing variety, holds no special qualifications for this district. In fact it is too late in maturity.

Cultural details.—Previous crop, Japanese millet, 1917; grazed off with cattle; ploughed, October, 1918; harrowed, 26th December; smoothed and irrigated in furrows 4½ feet apart; manured with 2 cwt. of P7 mixture per acre. The experiment was irrigated three times and cultivated twice during growth; harvested, 15th July, 1919. Effective rainfall, 499 points.

Farm 333.—Sowing operations were conducted on red sandy soil 30th and 31st December. Irrigation was practised in furrows 4½ feet apart, and the seed was sown through a single-horse maize dropper in the damp furrows. At the same time the plots were manured with P7 mixture at the rate of 2 cwt. per acre. An excellent germination followed, and growth was maintained well throughout the season. At one period it was apparent that some influence was retarding development of the plants, and it was decided to hill thoroughly, irrigate with two furrows (in place of one) in each row, and employ a slower rate of flow from the head ditch. This suggestion was followed with the desired effect. In the early stages both Leaming and Bathurst Crossbred shot ahead of other varieties, eventually producing the tallest stalk growth next to Brazilian White.

Silvermine, Funk's Yellow Dent, Bathurst Crossbred, and Leaming gave very good yields in the order mentioned, whilst Boone County White, Hickory King and Brazilian White compared unfavourably.

The yields obtained at this centre are highly creditable, and illustrate what can be done with maize on the light textured soils, providing the necessary attention is given during the growing period. The late sowing delayed the tasselling stages till after hot winds had ceased, which helped the yields considerably.

Cultural details.—Previous crop, maize for green fodder, 1917 (first crop); ploughed in August; graded in October; irrigated on 29th December; harrowed after sowing; irrigated during growth on 14th January and 3rd February; cultivated on 17th January, 10th and 19th February; hilled on 4th March; harvested, 26th to 30th June. Effective rainfall, 459 points.

Farm 883.—The experiment was sown 2nd and 3rd January in virgin red sandy soil. The furrow system of irrigating and planting with a maize dropper was again adopted with success, an excellent germination being obtained, except in the case of Hickory King and Cuzco. The former was handicapped by mouldy seed. Steady growth was maintained throughout the season, and hot winds ceased during the tasselling period. The plots were an object lesson to surrounding settlers, the concensus of opinion being that it was the finest crop of maize yet seen in this part of the district. Funk's Yellow Dent and Bathurst Crossbred again produced heavily, with King of the Earlies and Leaming not far behind. Cuzco maize (a flour type) failed to reach maturity. The yield of 53 bush. 28 lb. per acre obtained from Funk's Yellow Dent at this centre is highly creditable in such a season. The plots were manured with 2 cwt. P7 mixture per acre.

Cultural details.—Ploughed in December 8 inches deep and tine harrowed; irrigated, 20th December; cultivated twice with the rigid tooth cultivator and harrowed, 24th December; irrigated, 31st December; harrowed, 3rd

January. Irrigated during growth on 29th January and 19th March; cultivated on 30th January and 9th February; hilled on 9th February; harvested, 10th July. Effective rainfall, 459 points.

TABLE showing details of varieties under trial.

	Silvermine.	Funk's Yellow Dent.	Boone County White.	Leggett's Pride.	Brewer's Yellow Dent.	Goldmine.	Gold Standard Leaming.	Leaming.	Bathurst Crossbred.
Height of stalk	6 feet	7 feet	8 feet	8 feet	7 feet	6 feet	8 feet	8 feet	8 feet
Suckering	nil	nil	nil	nil	nil	nil	nil	nil	nil
Coarseness of stems ..	fine	fine	medium	medium	medium	fine	fine	fine	medium
Height of ears	3 feet	3½ feet	4 feet	4 feet	3 feet	3 feet	3 feet	4 feet	4½ feet
Erectness of ears	drooping	drooping	drooping	drooping	drooping	drooping	drooping	drooping	erect
Husk covering	good	good	fair	weak	weak	fair	good	good	weak
Number of ears per stalk..	one	one	one	one	two	one	two	two	two
Strength of stalk	good	good	good	good	good	fair	good	good	good
Disease	nil	nil	nil	nil	nil	nil	nil	nil	nil
Maturing period (in weeks)	20	22	23	22	22	23	26	22	23
Shelling percentage ..	80	79	76	74	78	80	80	79	80

	Brazilian White.	King of the Earlies.	Canada Early Flint.	Golden Nugget.	Hickory King.	Silvermine x Funk's Y. Dent Crossbred.	United States No. 133.	Cuzco.	Early Yellow Dent.
Height of stalk	7 feet	9 feet	4 feet	10 feet	8 feet	6 feet	7 feet	10 feet	6 feet
Suckering	nil	trace	nil	nil	trace	nil	fair	nil	nil
Coarseness of stems ..	medium	fine	fine	medium	fine	fine	fine	coarse	fine
Height of ears	4 feet	4½ feet	1½ feet	5 feet	3½ feet	3 feet	3 feet	5 feet	2½ feet
Erectness of ears	erect	drooping	erect	drooping	drooping	erect	drooping	erect	erect
Husk covering	good	good	good	v. good	good	fair	v. weak	v. fair	v. fair
Number of ears per stalk..	two	two	two	one	two	one	two	one	one
Strength of stalk	good	good	good	good	good	good	good	weak	good
Disease	nil	nil	dry rot	nil	nil	nil	nil	nil	dry rot
Maturing period (in weeks)	30	26	15	32	22	20	16	....	19
Shelling percentage ..	77	79	75	76	78	76	80	....	77

Such varieties as Gold Standard Leaming, Brazilian White, King of the Earlies, Golden Nugget, and Cuzco, are too late in maturity for this district.

TABLE showing acre yields from Variety Trials.

Variety.	Farm 330	Farm 797	Farm 148	Farm 543	Farm 159	Farm 333	Farm 883
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Silvermine	22 34	26 24	26 16	23 37	....	51 24	....
Funk's Yellow Dent (bulk) ..	30 12	29 21	....	17 32	19 40	50 25	53 28
Funk's Yellow Dent (stud) ..	....	....	....	20 44	....	....	....
Early Yellow Dent	28 52	25 4	15 24	....	15 4	....	....
Boone County White	20 38	....	25 4	....	....	35 5	....
Leggett's Pride	31 40	....	....	....	....	....	....
Brewer's Yellow Dent	....	31 19	....	....	....	....	....
Goldmine	....	....	21 12	....	15 42	....	....
Silvermine x F. Y. D. Crossbred	....	....	25 52	16 2	....	....	....
Gold Standard Leaming ..	....	....	....	....	20 35	....	....
Leaming	....	....	....	....	....	47 48	46 35
Bathurst Crossbred	....	....	....	....	....	49 36	51 0
Brazilian White	....	....	....	....	11 34	32 48	....
King of the Earlies	....	....	....	....	....	....	47 28
Canada Early Flint	....	....	....	....	7 48	....	....
Golden Nugget (Department's)	27 48	....	....	....	....	....	....
Golden Nugget (Farmer's) ..	21 24	....	....	....	....	....	....
Hickory King	....	....	....	....	....	39 1	36 49
Hickory King Crossbred (Farmer's)	....	....	....	....	....	....	43 42
United States No. 133	50 20	....	....	....	....	....	....

Manurial Trial.

To determine the efficiency of artificial fertilisers, an experiment was instituted on Farm 315, the manure being applied at the time of sowing on 5th December, Funk's Yellow Dent being the variety used. Two fertilisers were included, viz., superphosphate and P7 mixture (equal parts of bonedust and superphosphate), both being applied at the rate of 2 cwt. per acre. The germination was very good, and early growth favoured the manured sections. The maize manured with P7 mixture returned the highest yield, with large ears predominating, and a small percentage of nubbins. The latter, however, were prevalent in the unmanured plots. Hot winds during the tasselling period were responsible for reduced yields.

Cultural details.—Soil, red clay loam; previous crop, wheat, 1917; ploughed, in September; disc cultivated, 28th November; harrowed twice; irrigated, 2nd December. Harrowed after sowing; irrigated on 3rd and 27th January and 1st March; cultivated on 7th January and 5th February; harvested, 15th to 17th June. Effective rainfall, 479 points.

RESULTS of Manurial Trial.

Plot.	Acre Yield.		Cost of Manure.			Value of Increase less cost of Manure.			Shelling Percentage.
	bus.	lb.	£	s.	d.	£	s.	d.	
P7 Mixture	29	26	0	18	6	1	6	1½	82
Superphosphate	24	2	0	14	0	(—)0	7	4½	79
No manure (*Check*)	23	5	....			....			76

(—) Indicates loss.

In calculating the above returns, maize is valued at 7s. per bushel, superphosphate at 7s. per cwt., and P7 mixture at 9s. 3d. per cwt. A perusal of the above table shows P7 mixture to have been used profitably, whilst superphosphate showed a loss in comparison with unmanured plots.

Conclusions.

In view of the trying conditions during tasselling stages last season, the yields on the whole may be considered satisfactory. Of the twenty varieties under trial only a comparatively few can be used again, even for experimental purposes. A number are too late in maturity, whilst others do not yield sufficiently well. The varieties showing most promise are Silvermine, Funk's Yellow Dent, Bathurst Crossbred, Leaming, United States No. 133, Leggett's Pride, and Brewer's Yellow Dent, and with further trial these will probably be reduced considerably. It is not likely that maize growers will be able to compete favourably with coastal growers on the Sydney or Melbourne markets, but the culture of this crop must necessarily receive consideration from the settlers engaged in stock-raising, more especially in the fattening of pigs for bacon. Much higher yields can undoubtedly be obtained on the Murrumbidgee Irrigation Areas if reasonable attention is given to the necessity for cultivation.

In the first place, maize demands that the soil be well prepared, and in order to fulfil this a short fallow is essential, accompanied with deep ploughing. The evaporation of soil moisture during the month of December (planting time) calls for special attention in regard to methods of sowing. In order to effect a satisfactory germination it has been found essential to deal with small areas at a time, carefully watching the irrigation and cultivation prior to sowing. As wind is the main factor in causing loss of soil moisture, the grower should aim at a compacted seed-bed. The use of a maize dropper which compacts the soil round the seed cannot be too highly recommended. If a machine of this type is unprocurable, the practice of hand dropping and ploughing-in the seed is next in favour. A method adopted with success in planting the experiments last season was to irrigate in furrows 4½ feet apart, and to employ the single-horse maize dropper in these furrows as soon as the soil was sufficiently dry to carry a horse. The tine harrows were then used for filling in the furrows. With this system the dropper should be regulated to sow only about a half inch to one inch in depth, as the furrows are already about 3 inches deep. Throughout the experiments the rows were placed 4½ feet apart, dropping three grains every 3 to 3½ feet in the rows, allowing approximately for 7 lb. seed per acre.

No hard-and-fast rule can be laid down in regard to the time for irrigation, but it is essential to keep the plants growing steadily, and on no account should they receive a check from the tasselling stages onward. If hot winds are prevalent during tasselling, irrigation will assist in nullifying the bad effects.

The general tendency is to irrigate with too great a flow from the head ditch. If it is required to accelerate irrigation, two furrows should be employed between the rows in place of the usual one. Hilling is necessary to prevent lodging. Inter-row cultivation is absolutely essential with maize, and the depth should become shallower as the period of growth advances. Sowing in December is recommended to evade hot winds during tasselling, and in order to reach maturity before frosts sets in it is necessary to select early maturing varieties.

Up to the present time, Silvermine and Funk's Yellow Dent have yielded consistently well, and the Department's recommendations still hold good in this respect. In any case the crops sown in December mature late in the season, and these should be allowed to ripen thoroughly on the stalks before being harvested. If this is not observed, trouble may be experienced with mouldy grain. A dressing of P7 mixture at the rate of 2 cwt. per acre is recommended.

SMUT IN BROOM MILLET SEED.

SMUTTY sorghum and broom millet seed will badly affect the next crop if sown. Treatment with a 1½ per cent. bluestone solution as for wheat will be largely effective if the crop is not sown on infected land.

A GUERNSEY COW'S 30-DAYS' YIELD.

DURING July and August of the present year the Guernsey cow, Tulip des Pres (imp.) (193 A.G.H.P.), owned by Mr. E. P. Perry, "Nundorah," Scone, put up a fine record for both milk and butter-fat, and narrowly missed establishing a world's record for the Guernsey breed.

Tulip des Pres had just concluded a test of 365 days, during which she had yielded 15,759 lb. milk and 728·02 lb. butter-fat, and when she dropped her calf on 1st July, her owner intimated his desire to try to establish a world's record for a 30-day period for the breed. Arrangements were accordingly made by the Dairy Branch that, in addition to the testing under the United Pure-bred Dairy Cattle Breeders' Association's scheme (for which the cow was entered) an extra test should be carried out in the middle of the period of 30 days. The results are presented in the following table :—

	15th July.			30th July.			14th August.		
	Morning.	Noon.	Evening.	Morning	Noon.	Evening.	Morning.	Noon.	Evening.
Milk (in lb.)	23¼	17	19¼	28	21¾	24	27	21	21¾
Butter-fat percentage	4·6	7·5	5·9	4·	5·8	4·6	3·8	6·	4·2
Butter-fat (in lb.) ..	1·069	1·275	1·135	1·12	1·261	1·104	1·026	1·26	·913

Averaging the records of 15th and 30th July and those again of 30th July and 14th of August, the yields for the two periods of fifteen days each are :—

First period of 15 days—Milk yield 999·38 lb. ; Butter-fat 52·23 lb.
Second ,, ,, ,, 1,076·25 lb. ; ,, 50·13 lb.

Total for 30 days ... ,, 2,075·63 lb. ,, 102·36 lb.

The test on the evening of 14th August dropped considerably as the result of a bitterly cold wind in the afternoon following a very warm morning.

The best recorded 30-day performances of Guernseys in America are those of May Rilma (milk yield 1,839·9 lb., butter-fat 103·03 lb.), and Murne Cowan (milk yield 2,361·5 lb., butter-fat 102·02 lb.). These cows were milked four times daily.

Of New South Wales cows of other breeds, the best recorded milk yields for 30 days are those of the Milking Shorthorns, Melba VII, in January, 1917, and Empress, in September, 1916 (both cows giving 2,085 lb. milk), and the best recorded butter-fat yields are those of Melba VII in November, 1916, (111·60 lb.), and January, 1917 (92·88 lb.), and the Jersey Brighton Vanilla II in November, 1916 (89·85 lb.). Tulip des Pres and Empress were milked three times per day during the months mentioned, and Melba VII and Brighton Vanilla II were milked twice per day.

While putting up this record Tulip des Pres was fed as follows :— July 15th, 1919 : 13 lb. grain mixture, 4 lb. molasses, 20 lb. chaff, 10 lb. lucerne hay ; pastured on lucerne. July 30th : 1919, 19½ lb. grain mixture, 4 lb. molasses ; chaff, hay, and pasture same as for 15th. August 8th, 1919 : 13½ lb. grain mixture, 4 lb. molasses ; chaff, hay, and pastures as above. The grain mixture consisted of bran three parts, oats one part, barley one part, linseed meal one part.

This information regarding rations has been given by Mr. Perry, under the form of a sworn declaration as provided for in the rules of the United Breeders' Association's testing scheme.—L. T. MACINNES, Dairy Expert.

Turnips as Winter Feed in New England.

J. E. MORROW, H.D.A., Stock Assistant, Glen Innes Experiment Farm.

MUCH diversity of opinion exists regarding the advantages that attach to the growing of turnips and swedes as winter fodder for sheep, and the subject is well worth farmers' consideration, especially in a district that, like New England, has climatic conditions and soils so admirably adapted to the crop, and where the sheep to a large extent are run in conjunction with cereals. When, as has been happening lately, closer settlement and drought necessitate intense culture, and hand-feeding becomes a common topic of conversation amongst sheep-farmers and graziers, the interest attaching to turnips cannot fail to be greater than ever.

Although many varieties of turnips and swedes are in existence, the two species at present in mind are the common white turnip (*Brassica rapa*), which is typically the shape of a flattened globe with the light green leaves spread direct therefrom, and the swede (*Brassica campestris*), which has a more upright growth, is somewhat cylindrical in shape, and has bluish green leaves rising from a so-called "neck" or "collar."

The firm, crisp, yellow, nutritious flesh of the swede greatly adds to its keeping qualities as compared with the white, soft flesh and delicate constitution of the turnip, which has a tendency to rot when exposed to such adverse climatic conditions as are sometimes experienced in New England in the form of frost and snow.

In a comparison drawn from observations of the two crops, it may be said that the swede is a much slower grower and produces lighter crops than the turnip, but is a somewhat better frost resister, and according to analysis it contains a higher percentage of sugar and a smaller percentage of water, while weight for weight the roots are of greater feeding value, though slightly more trying to the digestive organs.

Perhaps the greatest advantage of turnips and swedes as a food is their digestibility, for although the amount of dry matter is not great, it is all available, there being no indigestible woody fibre.

It may be said that the feeding of sheep on turnips and swedes alone is inadvisable, inasmuch as they are compelled to take into their system far more water than they require in their endeavour to obtain sufficient solids, thus incurring much waste of animal heat in raising the temperature of the water to body heat, but this may be overcome if free access is allowed to straw stacks, stubble, or natural pastures. The cultivation and management of the two crops are very similar and may therefore be considered together. Either can be grown with comparative ease and practically all soils are more or less suitable, though if grown on land of good quality—as the progress made by sheep placed on it will show—the results are superior in many ways.

Much variation in the percentages of the various constituents is found in the different analyses of turnips and swedes, but the following will serve as an example of an analysis :—

	Turnips.	Swedes.
	per cent.	per cent.
Water	92·0	87 0
Carbohydrates	5·3	9·5
Protein	1·1	1·3
Crude fibre	0·8	1·1
Fat...	0·1	0·1
Ash	0·7	1·0
	100·0	100 0

Preparation of the Land.

These crops being shallow rooters, it is essential that the plant food in the soil should be retained near the surface where it can be readily drawn upon.

Where the autumn rainfall is light, best results will be obtained from ploughing in the previous spring and by working the fallow to conserve the moisture which falls during the summer months. It is usually the custom, however, to have the fodder crop following wheat or oats (the stubble of which has been fed-off by sheep), and in this case it is advisable to plough as soon after harvest as possible and to work the land down to a fine tilth with harrows and cultivators prior to sowing.

Time and Rate of Sowing.

In New England sowings are best made in February or early March, though earlier sowings are not a disadvantage. The amount of moisture required by the roots demands that they should be growing at a period when the rainfall is most regular and the evaporation of soil moisture at a minimum, consequently about autumn.

By sowing early, the crop matures at a convenient time for feeding-off, and when of the greatest value to the grazier. In the New England district this is from midwinter or early spring, when the ewes are nearing parturition or are with lambs at foot, and when the prevalence of worms, &c., makes the general condition of the sheep a matter for consideration.

The seed may be sown at the rate of 4 to 5 lb. per acre if broadcast and 2 to 2½ lb. per acre if sown with a drill. The wheat-drill with grass-seed attachment can be utilised by blocking such portion of the drills as will ensure the required distance between the rows—about 2 feet 6 inches. If no grass-seed attachment is available, sowing may be made from the manure-box by mixing the seed with either manure or sand.

Manuring.

The rapidity of growth of turnips and swedes necessitates a ready supply of all the soil constituents they require and the substance above all others thus in demand is phosphoric acid. Superphosphate applied at the rate of ½ to 1 cwt. per acre supplies a readily available form of phosphoric acid. It has a marked effect on the growth of the young plants and results in a greatly increased yield.

To the man who is mixed-farming the advantages obtained by the growing and feeding-off of turnips and swedes is two-fold, for not only is the condition of the sheep retained, but the soil substantially benefits manurially. The manure from the sheep requires no transporting and it is fairly evenly distributed over the land in a fresh condition. Through the action of trampling, the various constituents are readily absorbed and so mix with the soil that when an agricultural crop is sown soon after feeding-off, an excellent start is afforded the young plants.

Feeding-off.

The great aim in feeding-off is to gain the maximum amount of feed with a minimum of waste, so that much is left to the discretion of the grazier, who will be guided by the consideration of such factors as: (1) the general condition of the sheep; (2) the amount of growth made by the crop; (3) the condition of natural pastures available; and (4) the prevalence of parasites (worms), &c.

The most economical method is to sow small areas, their size being determined by the number of sheep to be grazed. Should large areas be sown, however, temporary fencing may be utilised to allow only a small area to be fed-off at a time. In this manner much unnecessary waste due to trampling and fermenting can be avoided, and the stock have the benefit of frequent changes, which help materially in keeping them in condition and allow the previously fed-off crop sufficient time to make fresh growth.

If the crop is allowed to grow until nearing maturity before being fed-off many of the benefits are lost, as nothing tends to keep the succeeding growths sweeter, more palatable and more vigorous and to discourage rank and coarse ones than constant and judicious grazing. During the first feedings-off care must be taken that the sheep are not allowed to eat the leaves down too close to the "neck" or "collar," as this would seriously affect any succeeding growths. Where only a few sheep are kept a supply of roots can be dug from the field and carted and stored until such time as they may be required, when, if possible, it is advisable they should be sliced and fed in conjunction with straw or cocky chaff, &c. Where sheep are run on a large scale it is sometimes more practicable to turn them straight on to the crop and allow them free access to dig the roots up for themselves; it will be found under such circumstances that very little will remain, even the shells being eaten. When the crop appears to be finished a light ploughing will discover the quantity of roots still left in the field; these being made available, the sheep may then be turned on again.

The idea apparently held by many people that the feeding of turnips to sheep causes such ill-effects as abortion is not borne out by the experience of this farm. For the past eight years turnips and swedes have been grown here as a fodder crop for sheep without any ill-effects whatever, but free access has always been allowed to a grass run. This year (1919) an area of 35 acres was sown with turnips in conjunction with strips of rape. After providing winter grazing for 400 sheep on four different occasions, this was utilised for breeding ewes which so far have given a "drop" of nearly 90 per cent. of lambs, including a fair number of twins. It is interesting to note that the percentage of deaths amongst the lambs has only been 2 per cent.

Varieties.

The two varieties grown here for fodder crops which have given such excellent results are Purple Top Yellow Aberdeen and White Pomeranian Globe. Both are fairly heavy croppers producing an abundance of foliage, as well as solid, firm, palatable, and nutritious roots, though the former has proved by far the best variety for feeding-off of any variety tried here.

The poorness of our natural pastures and the scarcity of stock food and rain emphasise the advantage of having had an area of this valuable fodder-crop to rely on during the year. It is further emphasised by the fact that the sheep—both lambs and ewes—are in excellent condition, whilst the paddock shows promise of carrying them through a further dry spell.

POWDERY MILDEW ON CUCUMBERS.

POWDERY mildew on cucumbers can be successfully treated by dusting the plants with flowers of sulphur as soon as they seem to be affected. Care should be taken to get the sulphur on the under side of the leaves as well as on the top side. A rotation of crops is advisable, though the disease appears frequently on land that has never previously grown cucumbers, the spores apparently being carried in the air.

HORSE MANURE IN THE VEGETABLE GARDEN.

FOR general purposes in the vegetable garden, horse manure gives the best results when applied direct to the ground, either fresh or (preferably) after it has decomposed to a certain extent, rather than in the form of liquid manure. In a dry climate the manure is best used as a mulch. It then helps to hold the moisture in the ground, and the plant food that it contains is gradually washed into the soil.

If a liquid manure is required good results are obtained by using a mixture containing about 2 parts nitrate of soda, 1 part dried blood, 4 parts superphosphate, and 1 part sulphate of potash. This should be mixed thoroughly and 1 oz. to each gallon of water should be used.—A. H. E. McDONALD, Chief Inspector of Agriculture.

Elephant Grass

(*Pennisetum purpureum*).

Results of Trials during Season 1918-19.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

SINCE the report from Hawkesbury Agricultural College was published in the August issue of the *Agricultural Gazette,* the following additional reports have been received:—

Mr. A. H. Haywood, Manager, Wollongbar Experiment Farm, wrote:—The trials with Elephant grass at this farm have clearly demonstrated that it is a most valuable acquisition to our list of fodders. It was found best, however, to use it as a pasture, and not to allow the growth to exceed 3 feet in height before turning stock on, as when allowed to reach its maximum growth it became too coarse and woody to make the best fodder. It proved a great drought-resister, but subject to frost.

When the farm herd was turned on to the Elephant grass, the crop was 3 feet in height, and the growth was at a stage suitable for grazing off. It was found that the herd's milk yield was increased by 6 gallons after the first day's feeding.* The results have been so favourable that it is anticipated that this grass will come into great favour on the North Coast.

Mr. G. Marks, Manager, Grafton Experiment Farm, summarises the results of the trials of the grass, covering a period of two and a half years, as follows:—

1. Elephant grass is a good drought-resister and a rampant grower, yielding many heavy cuttings of fodder during the season.

2. After each cutting the parent stool sends up a larger number of stems, which are finer in growth and apparently contain less woody fibre than the first growth.

3. If allowed to approach the flowering stage before being cut the stems develop a woodiness that stock of all classes do not relish.

4. Tests made in feeding chaffed Elephant grass at the maximum stage of green growth, with three times its bulk of chaffed sugar-cane and maize, have resulted in much of the chaffed Elephant grass stems being left uneaten.

5. Elephant grass allowed to approach its maximum green growth is useless for winter feed for cattle, as is proved by tests carried out at this farm during the past three winters.

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* This was not considered to be conclusive, and further experiments are to be carried out.—E.B.

6. To be fed properly, the grass should be cut before it develops hard woody stems, and at a height not exceeding 6 or 7 feet.

7. If cut young, most classes of cattle will eat it, preferably chaffed.

8. Cutting Elephant grass when half grown causes excessive bleeding, whilst the following growth of finer stems appears less able to withstand severe droughts or heavy frosts.

9. Heavy frosts cut the young growths severely. Plantings should accordingly be made in localities as free from frost as possible.

10. In every trial made at this farm, cattle of all ages preferred lucerne, maize, sugar-cane and sorghums to Elephant grass, even though the latter was cut young and fed at its most palatable stage.

Elephant grass should not be planted to the exclusion of such well-known and proven fodders as lucerne, maize, sugar-cane or sorghum. The grass is entitled to a place on the North Coast farm, subject to the above suggestions, but stockowners should be careful not to plant too extensively, or to rely on it exclusively until they have tested it themselves in comparison with the old and reliable fodders above mentioned.

At Cowra and Yanco experiment farms the flag of this grass has been cut down by the frosts of last winter, but the roots have not been affected in the slightest, and the shoot is coming away well this month (September). The grass at Cowra was grazed down right to the ground just previous to the frosts.

Some Farmers' Opinions.

Many farmers have reported favourably on this grass; amongst them are the following :—

Mr. G. Douglas, Coonabarabran.—Elephant grass stands on its own. I planted it in November when the ground was fairly dry, so I put about a pint of water with each root, and in a month the grass was about 2 feet high. I let it grow to 4 feet and cut it, and it kept on growing. When we had rain in the end of February it grew 18 inches to 2 feet in a fortnight. I cut it about three weeks ago, and it is 2 feet high now. We have had frosts every morning during the last week, but they have not hurt it. The sets are about a foot across. A lot of people have seen it and all are anxious to get roots of it.

Mr. A. Smith, Dungog.—Five or six cuttings grew. It was well looked after owing to the drought, and was cut about 24th February, having reached a height of 6 feet, and stooled in a wonderful way. Cattle and horses ate it greedily. The yield was not weighed, but there were about five bundles, each containing as much as a man could get his arms around. I also cut it again last week, but did not calculate the yield. There is plenty of grass and green feed now, and cows do not relish it as they did last time, but horses seem to like it as well as ever.

Mr. W. E. Parry, Springwood.—I planted it in new ground, a sandy loam of good depth, with little or no manure. Ever since planting there has been a continuous drought, but notwithstanding it has done very well. It has stooled out abundantly, and in some cases there are forty or fifty stems to a plant, and as much as 6 feet high. The cattle got it once and ate it down tight, and since November last I have cut it three times. The animals like it, and will pass by anything else to get it. I may say the animals do not leave a blade in the feed-box. It is my intention to divide and spread it over an acre of flats, and I expect it to do well there—even better than in its present position.

Mr. W. Howard, *via* Bundaberg, Queensland.—The yield worked out at 82 tons per acre. The young growth was eaten readily, and it matured seed readily. The cows would not eat the mature stalks.*

Mr. D. Gunson, Kooweerup, Victoria.—Elephant grass has proved itself strong and vigorous, not requiring more special care than any other fodder plant. The spring was exceptionally dry, with no rain until 18th February, but the grass stooled and grew to 2 feet by 22nd February, responding very quickly to the rain. It was grazed off by a well-fed cow on 26th February and eaten readily, after which it grew quickly, stooling again, and producing foliage of a finer character upon the original grazed-down stems. It has grown to 3 feet high again, but is now checked by severe frosts.

Summary.

1. It is now evident that Elephant grass is not only useful for coastal districts, but also for interior localities—not too elevated—with a rainfall of over 20 inches.
2. To get the best use from the grass it should be cut or grazed up to a height of 6 feet.
3. It will probably have a place as a pasture grass, but for this purpose will want planting closer than when grown for soiling. Trials are now being conducted with plants 3 to 4 feet apart.
4. No growth can be expected in the winter, but ordinary frosts on the coast or even on the tablelands will not kill it out. The grass can be allowed to grow right up to frosts, and then cut.
5. It is one of the most drought-resistant grasses we have yet grown, as shown by its behaviour, not only on the coast but in the interior.
6. It is one of the easiest of plants to propagate from "sets."

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* This correspondent inquired if the grass was suitable for ensilage, and has been informed that experiments in this direction are to be conducted.—E.B.

CAN POPPIES HARM BEES?

Question.—"The writer was recently informed that one cause of bees dying out was their extracting a certain amount of opium from poppies."

Answer.—"The opium poppy is rarely grown here, and the opium is in the unripe capsule. In my long experience, I never heard of poppies of any kind injuring bees."—J. H. MAIDEN.

VINEYARD NOTES FOR DECEMBER.

FLOWERING will be over and the berries will be assuming a fair size, and it will be possible to form a fair idea with regard to the possibilities of the crop. The absence of winter rain and dry conditions throughout the spring combine to make the position precarious. Every means of conserving moisture—consisting mainly in good cultivation and destruction of weeds—should be adopted.

Where irrigation is possible, the problem is solved so far as table grapes are concerned; and even in the case of wine varieties irrigation, with a view to maintaining steady development of the crop, is a great advantage in such a period as the country is passing through. Unfortunately, but few are so favourably situated that they can irrigate their wine vines. In most cases the young growth has come away very well, and shows an abundant promise of a good crop. The fulfilment of that promise depends upon the amount of rain which may fall during the summer. So far, there has been very little evidence of disease in the vines. In one or two cases traces of black spot have been noticed, and where such is the case it would be as well to spray the vines with Bordeaux mixture with a view to checking further development of the trouble. It must be remembered that even a slight attack from this disease lays the foundation for very serious infection. At the same time, even under favourable conditions, its spread is gradual, and therefore no difficulty is experienced in keeping ahead of it with the sprays. More particularly on the coast, spraying must be looked upon as an insurance.

Disbudding of the vines should be practically complete, though much can still be done, especially among table grapes. Having in view the fact that it pays best to produce only the finest fruit, it will be found beneficial to remove late and secondary bunches. The grower must, of course, have in view the capabilities of the vine and treat it accordingly. Topping will no doubt be carried out where the vines are making strong growth, but it should be done with due regard to the functions of the leaves. Indiscriminate topping with a view to concentrating the sap in the fruit is wrong in principle. As a matter of fact, the interference with the foliage has the opposite effect. The leaves are necessary for the elaboration of the crude sap, and therefore the maturing of the fruit and the development of sugar are portion of their functions. Where growth is so heavy as to impede cultivation or to needlessly shade the fruit to the encouragement of disease, topping is permissible. Apart from this it is a mistake.

In some localities caterpillars have done considerable damage. The arsenate of lead spray will serve to keep them in check.—H. E. LAFFER, Viticultural Expert.

Fodder Crops for Dairy Farmers.

Murrumbidgee Irrigation Areas.

G. G. St. CLAIR POTTS, H.D.A., H.D.D., Assistant Inspector of Agriculture.

The irrigation farmer is in the happy position of being able to grow a succession of fodder crops throughout the year, but one is forced to admit that this opportunity is not availed of to the fullest extent on the Murrumbidgee Irrigation Areas. It is obvious that unless settlers pay more attention to the cultivation of fodders for dairy stock during both winter and summer months, the dairying industry will not be as highly profitable as it might be. Any dairy farmer is conversant with the fact that cows must be well fed to produce abundantly, and quality, or feeding value, calls for as much consideration as quantity.

Without detracting from the value of our natural grasses and clovers, their behaviour during the past season has demonstrated that little reliance can be placed upon them for a continuous supply of food. In view of the dry seasons that occur periodically, with consequent shortage of natural herbage, the dairy farmer who fails to pay attention to the cultivated fodders will meet with difficulties sooner or later; even if he is favoured with good rainfall, any cultivated crops can be readily conserved as silage or hay, and disposed of at high rates during times of scarcity in other districts, or made available to carry a larger herd on the property.

The sowing table below clearly indicates that a very fine selection of crops is at the disposal of any settler who realises the necessity of feeding to obtain maximum results.

Summer Crops.

Lucerne.—Undoubtedly this is the most valuable fodder for dairy farmers. The deepest and lightest textured soil on the holding should be selected for its culture. Strict attention must be paid to initial preparation of the soil and grading. Lucerne is delicate in the early stages of growth and requires nursing to a certain extent. If this is not recognised, disappointing results will follow. The erection of check banks half a chain to a chain apart is recommended as providing for an even and quick distribution of water and effective drainage, the latter being of vital importance. Rolling after sowing is a good practice. When once established, lucerne responds to cultivation during the winter and top-dressing with 1 to 2 cwt. of superphosphate per acre. This crop will not stand grazing to any extent, and in view of this, it is economical to reserve it for hay purposes, balancing the ration to the best advantage and eliminating the danger of hoven or bloat, which frequently occurs on these areas. Irrigation should be practised when required, preferably prior to each cutting, the time for which should be determined by the condition of the buds at the base of the plant. In a vigorous, well-cared for stand of lucerne five to seven cuts of hay have been obtained, averaging ¾ to 1 ton per acre each cut.

Sudan Grass.—This is certainly an ideal fodder under irrigation, either for green feed or for hay. Its high feeding value, together with its succulence, palatability, rapidity of growth, yielding capacity, and ease of feeding should be recognised by the dairy farmer.

Sudan grass requires regular irrigation and responds to cultivation between the rows. The practice of rolling after sowing is strongly recommended. It ensures a good germination, providing due attention has been paid to early soil preparation, irrigation, and planting not deeper than 1 to 2 inches.

The best time for grazing is when the grass is 2 feet high, and if sown early it can be fed off seven to eight times during the growing season. For hay purposes it is important to cut it in the flowering stages. If left until a later period, the subsequent growth will suffer considerably and the feeding value will be impaired. When broadcasted or sown through a wheat drill in rows closer than 2½ feet apart, flood irrigation is usually practised, and in order to control the application of water, it is advisable to erect check banks half a chain to one chain apart. The grass benefits largely if fertilised with superphosphate or with P7 mixture (equal parts of bonedust and superphosphate) at the rate of 1 to 2 cwt. per acre.

Although belonging to the sorghum family, Sudan grass has never been responsible for prussic acid poisoning, and can be grazed at any stage with impunity. Yields of up to 11¾ tons of green fodder per acre (drying out to 4¾ tons of hay) have been obtained in farmers' experiments on the areas. In these cases the growing period extended over seven months.

Maize.—This crop is eminently suited for green fodder or silage purposes Economy in feeding is exercised when the stalks are cut and chaffed. Maize does not lend itself to grazing. A rotation of sowings in small areas (up to 3 acres at a time) is recommended, and also the employment of a maize dropper for planting. The land should be irrigated prior to sowing, and compaction of the soil around the seed is absolutely essential to a satisfactory germination. Inter-row cultivation during growth and furrow irrigation tend towards improved yields. The highest feeding value and yield are obtained at that stage when the grain is glazing, or in the advanced milky condition. The ration can be balanced by sowing cowpeas or soy beans in conjunction with the maize. Improved Yellow Dent is recommended as the best variety under most conditions, whilst Red Hogan and Leaming are promising, the two former being late maturers (fifteen weeks) and the latter mid-season (twelve weeks).

Saccharine Sorghum.—The sweet sorghums are valuable summer fodders, especially when planted late in the season. They retain their succulence far into the cold months, and provide excellent roughage and silage. Owing to the possibility of prussic acid poisoning, stock should not have access to the crops until the ears or the heads bearing the seed have made their appearance. At this stage there is no danger. Grazing is discountenanced. Sorghums respond well to frequent irrigation and grow profusely on all types of soil. A dressing of 1 cwt. superphosphate per acre is recommended. Both Early Amber Cane and Planter's Friend are good varieties, the latter being more suitable for late planting owing to its ability to remain succulent longer after maturity is reached. Saccaline, a variety giving excellent returns in coastal districts but so far untried here, should be valuable under irrigation.

Japanese Millet.—Where a quick-growing catch crop is required early or late in the season, this millet answers the purpose. It germinates in a colder soil and grows faster during the cool weeks of spring than Sudan grass, and for these reasons it is regarded as a useful crop for grazing during the spring, late summer, and autumn. Japanese millet revels in water, and to produce maximum yields irrigation should be practised frequently, especially on the heavy types of soil. Hungarian millet is next in favour to Sudan grass for hay purposes.

Winter Crops.

Wheat.—A number of varieties that provide valuable fodder throughout the winter and early spring months are at the disposal of growers. This crop is not so satisfactory for grazing purposes, but may be cut and fed in the green state with good results. Legumes, such as Grey field peas and Golden vetches, grow remarkably well in conjunction with wheat and add considerably to the feeding value.. If not required for feeding green, the combination makes an excellent class of hay. The early varieties of wheat recommended are Firbank, Thew, Florence and Improved Steinwedel, whilst the most suitable of those maturing somewhat later are Huguenot, Zealand, Yandilla King and Marshall's No. 3.

Oats.—This crop can be grazed several times and then allowed to mature for hay. The sowing season is lengthy, and a good selection of varieties is available. Ruakura is especially valuable for grazing purposes, being an early maturer, stooling well and producing abundance of flag. Sunrise, on the other hand, is a weak stooler and an upright grower, maturing about the same time as Ruakura. Owing to its habit of growth Sunrise is most suitable for sowing with legumes such as have been previously mentioned. Other varieties maturing a little later are Algerian and Guyra; with Abundance the latest maturer of all.

Barley.—This is a valuable winter crop for grazing, but not so suitable for hay. Heavy yields are obtained from both Cape and Skinless varieties, the latter maturing earlier and moving faster, but failing to stand frost as well as the former. If sown in February, this crop provides good fodder during the early winter months, maintaining the milk flow extremely well. Legumes can be grown successfully in combination with barley, and add to the value of the crop.

Rye Grass.—This is a rapid growing winter grass, yielding a succulent fodder that is relished by stock. It stools well and can be grazed continuously from June to October. Two varieties are worthy of cultivation, namely, Italian and Westernwolth's. These are annuals and need to be resown each year. Owing to the seed being small and light, care should be taken to cover it very lightly when sowing, and to adopt the practice of rolling to ensure a supply of moisture until germination is effected. Yields of up to 8¼ tons of green fodder per acre have been obtained.

Golden Vetches and Grey Field Peas.—Either of these can be sown alone or in conjunction with cereals. Their culture is strongly recommended for the purpose of balancing rations, which is a most important question in feeding for milk production of good quality.

Preparation of the Soil.

In regard to the cultivation of fodders under irrigation, it is essential that the land be prepared early and thoroughly. Too much importance cannot be attached to the short fallow, or period of rest, with the sweetening and releasing of plant foods by oxidation that take place during such an interval. Moreover, the mechanical condition of the soil is improved and a satisfactory seed-bed assured. Irrigation in all cases should be practised prior to sowing unless natural precipitation is copious.

In reference to the winter fodders, check banks should be made from 1 to 1½ chains apart to facilitate irrigation during the early summer months.

The practice of cross-harrowing the growing crop is sound, and the application of ½ to ¾ cwt. of superphosphate per acre proves profitable.

SOWING TABLE of Fodder Crops, Murrumbidgee Irrigation Areas.

Crop.	When to Sow.	Quantity of Seed per acre.	How to Sow.	Available for Grazing.	Available for Cutting.
Lucerne	April to June Aug. to Sept.	12 lb. to 15 lb.	Drilled in rows 7 inches apart or broadcast.	Sept. to June	Oct. to June.
Sudan Grass	Oct. to Jan.	4 lb. 10 lb. 12 lb. to 15 lb.	Rows 3 feet apart Drilled 7 inches apart Broadcast	Nov. to June	Jan. to June.
Maize	Sept. to Jan.	20 lb. to 25 lb.	Rows 3 feet apart	....	Dec. to May.
Sorghum	Sept. to Jan.	8 lb. to 10 lb 15 lb. to 25 lb.	Rows 3 feet apart Drilled 7 inches apart or broadcast.	....	Dec. to July.
Japanese Millet.	Sept. to Feb.	6 lb. to 8 lb. 15 lb. to 20 lb.	Rows 3 feet apart Broadcast	Nov. to May	Jan. to May.
Cowpeas	Sept. to Dec.	20 lb. to 25 lb. 8 lb. to 10 lb. with maize.	Broadcast Rows 3 feet apart	....	Jan. to May.
Barley	Feb. to July	60 lb. to 90 lb.	Drilled or broadcast	May to Nov.	Aug. to Dec.
Oats	Feb. to Aug.	60 lb. to 80 lb.	,, ,,	June to Dec.	Oct. to Dec.
Wheat	March to July	60 lb. to 90 lb.	,, ,,	June to Nov.	Oct. to Dec.
Rye	March to June	60 lb. to 90 lb.	,, ,,	June to Nov.	....
Rye Grass	March to June	12 lb. to 15 lb.	Broadcast	June to Oct.	Oct. to Dec.
Field Peas, Vetches.	Feb. to May	Alone, 60 lb. With cereal, 30 lb.	Drilled or broadcast	June to Nov.	Aug. to Dec.

The Peach Tip Moth.

(*Laspeyresia molesta* Busck.)

WALTER W. FROGGATT, F.L.S., Government Entomologist.

THE advent of this small moth into New South Wales did not take place until about 1909, when it was first noticed in suburban gardens, boring into the tips of the young shoots of the peach trees. In the early summer these dead tips are very noticeable, the damage often causing an abnormal exudation of gum, which apparently often smothers the tiny caterpillars while they are at work. At first the damage was not considered very serious, and some of the orchardists christened the grubs "summer pruners." When, however, it was discovered that there were several regular broods of these little moths through the season, and that the later ones turned their attention to the green and ripening fruit, it was realised that we had another orchard pest at work—and one almost as bad as the codlin moth.

The pest soon began to spread inland, and before long was all over the Ryde and Parramatta districts. It is now one of the pests to be reckoned with in the Gosford and Newcastle areas, and it is only a matter of time when it will become established throughout the orchard districts of Australia.

As there had been considerable doubt about the correct identification of this moth, when the preliminary report was published in this journal in May, 1914, no name was attached to it. It was recognised, from its first appearance in the vicinity of Sydney, that it was a visitant from abroad, and not an indigenous species. In looking up the literature on the subject, we found that it appeared to agree with Saunders' description of the peach twig moth (*Anarsia lineatella*), described and figured in his "Insect Pests of the Farm, Orchard and Garden," and common in the United States, where its larva damages the branchlets of the peach tree in a very similar manner to that of the peach tip moth.

Meanwhile, a good deal of interest has been taken in the United States in the spread of a somewhat similar-looking little moth doing almost identical damage to the peach tree. The latter was studied by Dr. A. Busck, of the National Museum at Washington, who decided that it was an unknown species; he described and named it *Laspeyresia molesta*, and defined it as the "oriental fruit moth," to distinguish it from the "peach twig" or "peach tip moth" of the United States.

At the request of Dr. Busck, I forwarded a series of our peach tip moth to Washington, and he has since reported as follows:—

"This material enables the definite determination that the species is *Laspeyresia molesta* Busck, as we suspected. Fortunately the specimens sent included males and pupæ, and we have made a very thorough examination of every character, including the genitalia, which leaves no room to doubt the identity of the species. I quite agree with you that the species is not indigenous of Australia, but has been introduced there directly, or via California, from Japan; the species is, in my opinion, originally Asiatic."

At a conference of Departmental officers last year it was agreed that Inspector Brooks of the Gosford district (which is badly infested with peach tip moth) should carry out in conjunction with the writer, a series of experiments regarding the times of infestation of the pest, the number of its broods annually, and the action of sprays or other methods of keeping it in check.

Previous investigation had been carried on in the Ryde district by Inspector Gallard, who found spraying difficult and very unsatisfactory, but bandaging under the same lines as for codlin moth productive of good results; in the later broods, in particular, he trapped numbers of larvæ under the bandages.

Our experiments last season were confined to Mr. Archbold's orchards at Narara, where several plots of peach trees were kept under observation. The season was later than usual, but we found the caterpillars at work in the tips towards the end of October. On 18th November we could not find a single live larva or pupa in the damaged twigs, though most of the bores contained their castings. At this date we bandaged thirty-seven peach trees in different parts of the orchard, and in the first week in December Mr. Brooks examined and replaced all the bandages without finding any larvæ or pupæ in them, spraying every alternate tree with arsenate of lead. On 16th December, Mr. Brooks and the writer went over the bandaged trees, and found a number of pupæ and three larvæ, so it was evident that they had all come in from the tips or the trunk of the trees within the previous week; within about a week or ten days, the second crop of moths would have emerged and reinfested the late fruit.

From the middle of December Mr. Brooks watched the trees and removed the bandages regularly. The moths attacked the peach tips during the early part of January, and until the early part of February he did not find anything under the bandages; on the 3rd of that month, however, he found ten chrysalids under the bandages on an Alberta peach tree. He collected these chrysalids, and from them bred out three moths and four parasites. The latter, on examination, proved to be identical with *Gambrus stokesi*, described by Cameron from specimens bred from codlin moth pupæ, also obtained in the Gosford district some years ago; from which it would appear that many small moth caterpillars find an active enemy in this little ichneumon wasp.

"I THANK you very much for the Poultry Notes you have so kindly forwarded to me. They have been very helpful indeed, and I look forward to them more than ever now."—A Newport poultry-keeper.

The Utility of the Spray Gun.

W. J. ALLEN.

The possible utility of the spray gun has been under consideration for some time, and with the object of its more positive estimation a gun was recently imported from America and tested at Glen Innes Experiment Farm.

In the preliminary trial the gun was attached to a ½-inch hose, but it failed to give the long distance spray even at over 300 lb. pressure, and it was therefore tried with ¾-inch hose, the ⅝-inch hose specified by the makers as a minimum not being obtainable. Spraying with the gun was proceeded with until the nozzleman was thoroughly accustomed to its use.

The test was carried out on an even bed of four rows of Buncombe apple trees, two rows of which (numbering thirty-one trees to the row) were sprayed in the ordinary manner—that is, by the use of two leads of ½-inch hose and two Friend cyclone angle nozzles on each hose at 200 lb. pressure—two operators being engaged. The actual time taken in applying the spray was 61 minutes, and the quantity of spray used 190 gallons.

The other two rows (numbering thirty-one trees to the row) were sprayed with the gun on the ¾-inch hose at a pressure of 325 lb., requiring one man to operate. The actual time taken in applying the spray was 96 minutes and the quantity used was 195 gallons. For the purpose of comparison the first part of the trial must be brought to a one-man basis, which would double the time, making 122 minutes and giving a saving in favour of the gun of 26 minutes in applying 195 gallons of spray.

Actually these tests were hardly comparable, and in order to make a truly comparable test, two of the same rows of Buncombe trees were sprayed again with double nozzles at 325 lb. pressure. Rods were used just long enough to spray the highest tree in the row and the nozzleman first practised at the 325 lb. pressure before starting on the test. The result was that with the two leads of hose, with a double nozzle on each at 325 lb. pressure, the two rows (total sixty-two trees) were sprayed in 35 minutes, using 160 gallons of spray. Doubling this time for purposes of comparison with the gun (which is operated by one man only), a saving is shown of 26 minutes in time and 35 gallons of spray in favour of the nozzles at 325 lb. pressure. It should also be noted that less spray was used with nozzles at 325 lb. pressure than at 200 lb. pressure. Earlier tests in this direction showed that working at from 180 to 200 lb. pressure was more economical in material as well as time than at 150 to 160 lb.

The gun was not considered satisfactory. Its great advantage would be in acting as a long-distance nozzle so that high trees could be sprayed without the use of excessively long and cumbersome rods or towers; but the highest tree in the test block was 12 feet, and, while this was quite the limit to which the gun would throw a spray, trees of equal height can be sprayed with rods of moderate and not unwieldy length. Again, the work done by the gun appeared to be faulty near the tops of the 11 to 12-foot trees, while one cannot spray downwards on to the tops of the trees with a gun from the ground as one can with an angle nozzle on a rod. The operator also found the gun far more tiring to use than the rod and nozzles.

The day on which the test was carried out was almost calm, but, even so, the operator with the gun could not avoid the spray, and on a fairly windy day on which the gun was previously used he was literally soaked with spray. It would be impracticable, therefore, to apply caustic sprays, such as lime-sulphur, except in very calm weather. With an angle nozzle on the end of even a fairly short rod, the operator can avoid the spray to a great extent.

WHY DANISH COWS IMPROVED IN PRODUCTION.

THE average man in the street may fancy that Danish agriculture has attained the leading position in Danish national housekeeping by virtue of the natural fertility of the Danish soil. This is not the case. In spite of every semblance to the contrary, the greater part of the Danish soil is naturally poor and unproductive compared with enormous areas in other parts of the world that are at this moment wholly or partially uncultivated. It is equally as erroneous to assume that the Danish dairy cows of the sixties possessed special natural qualities with regard to their milk-producing powers. According to dairy experts the number of cows and the average milk and butter yield per cow during the last sixty years were as follows :—

Year.	No. of Cows.	Average Yield per Cow.	
		Milk.	Butter.
		lb.	lb.
1861	756,800	220	68
1881	898,800	363·8	130
1903	1,089,000	551·1	216
1914	1,310,000	606·1	240
1916	1,141,000	588·6	233
1918	1,024,000	443·1	174

The progressive increase in milk yield between 1861 and 1914 may be ascribed to the following factors :—

1. Pure-bred sires and breeding associations.
2. Careful selection and breeding based on the records of breeding associations and cow-testing associations.
3. Elimination of old and bad-paying cows by means of periodical milk tests and butter-fat records.
4. Better and more carefully blended concentrated feeds, and warmer, cleaner, and better ventilated cow-barns.
5. Regular and clean milking.—J. J. DUNNE, Denmark, in *Hoard's Dairyman.*

The Culture of Roses for their Perfume.

E. N. WARD, Superintendent, Botanic Gardens, Sydney.

WHAT possibilities lie in the culture in this State of flowers and plants that possess medicinal and perfume qualities is a question that has been frequently discussed. That there are possibilities is undoubted. It must be remembered, however, that the cultivation of perfume plants as a serious and extensive business calls for a considerable amount of both capital and knowledge, and that (largely by reason of the delicacy of the industry's medium) its advanced aspects are attended by considerable risk.

Taste in perfumes is to some extent subject to habit and tradition, and it is inevitable that the formation of a widely competitive industry here would necessitate the importation of certain proved and popular perfume flower varieties from European centres of the industry. Here, at once, the way becomes a little complicated and the horticulturist's pleasant prospect slightly obscured.

For particular example, we may take the rose. Commercial rose perfumes are manufactured from geranium oil, oil of pelargonium, otto of rose, and synthetically—so cheaply by the last-named method and with such artistry that the synthetic industry must be taken into serious account by anyone thinking of investing capital in the preparation of flower scents.

Geranium oil is distilled from *Andropogon Schœnanthus* of Linn.—not from *A. Schœnanthus* of Wallich, which is identical with the lemon grass *A. citratus* DC. grown in the Sydney Botanic Gardens, and which yields lemon grass oil. The first-named is not in cultivation in the gardens. Lemon grass oil is used to adulterate the true geranium oil or oil of pelargonium, which in turn is used to adulterate the otto of rose.

Oil of pelargonium is distilled chiefly from varieties of *Pelargonium radula*, var. *roseum*, a native of the Cape. Numerous forms and varieties of this plant are grown all over Europe, particularly in France, Spain and Bulgaria, under the name of *Geranium Rosat*. The most delicate perfume is obtained from plants that are grown on dry arid slopes where they are stunted in growth. Plants grown on low-lying flats that can be irrigated, give three crops annually and produce large quantities of oil, but of an inferior quality. This oil is also distilled from two other Cape Pelargoniums—*P. odoratissimum* and *P. capitatum*. A few years ago the Director of the Sydney Botanic Gardens obtained from the late Professor Pearson (then Director of the Cape Botanic Gardens) plants of these three oil-producing pelargoniums. The most important one, *P. radula*, var. *roseum*—the source of the *Geranium Rosat* of the Grasse growers of France—arrived in good condition, and hundreds of plants have been propagated from it. *P. odoratissimum* arrived just alive and is now a healthy plant, but has not been propagated; and *P. capitatum* was not alive when it was landed. Even if the plant sent by Professor Pearson is questioned by those who have seen the varieties of *Geranium Rosat* growing at Grasse, it would be better to land a plant alive and propagate here rather than to import a large number.

The true otto of rose is extracted by distillation or by the enfleurage process from the petals before bursting of *Rosa centifolia* and *R. damascena* and many varieties that have the peculiar damask perfume, which in France go under the name of Rose de Mai. If it were possible to import a large number of plants of Rose de Mai from France it would be a gamble as to what particular rose would be sent. They might send one of the two species mentioned or some hybrid or variety, the flowers of which produce the exact damask perfume, but of which there are many in this country already.

It would not be practicable to import a large number of rose plants of any kind from Europe. Roses for export are grown and prepared in a special way, and then sent from all parts of Europe to a special trade distributing agency for export. When they arrive in this country these plants are too costly to distribute at once to the public; the importers propagate without delay from what buds are alive, and from plants so propagated they take more buds until they have worked up a sufficient stock by bud grafting to enable them to recoup themselves for the cost of the importation, the product being sold for a few seasons at a higher rate than those in the general lists. The only way to procure a large quantity of rose plants of any kind from Europe would be to place an order with one of our reliable rose specialists, who might be asked to quote a price and state a probable date for delivery.

The Gosford district has sometimes been suggested as a suitable one for the undertaking under discussion, but I doubt whether the Rose de Mai varieties of France could be grown there profitably, though several roses possessing the true damask perfume have proved themselves to be quite vigorous in that district. Such roses are Zephirine Drouhin, Marie Baumann, General McArthur, and Gruss au Teplitz. These give several crops each year, while *Rosa centifolia* and its Rose de Mai forms would only give one short flush in our November heat, necessitating a rush of labour to harvest the blooms. I have obtained excellent otto of rose from these particular varieties by the process of enfleurage, but was surprised when, on submitting my sample for test to one of our manufacturing chemists, a synthetic sample was made up for me of remarkable similarity to my own, but worth only as many shillings as mine was worth pounds!

For the cultivation of those flowers producing the otto of rose adulterants or of medicinal plants, I prefer Yanco and Mirrool, on blocks adjoining the arid slopes, or the slopes of the Hawkesbury ranges. For the cultivation of the rose for commercial purposes, the best rose soil procurable should be secured. The ideal is a rich, heavy loam with a clay subsoil.

Poultry Notes.

DECEMBER.

JAMES HADLINGTON, Poultry Expert.

FROM this month onward many hens that are completing their second year of laying (that is to say, hens 24 to 30 months of age) will be ceasing to lay, and a sharp lookout should be kept upon such with a view to marketing them as soon as it is apparent that laying is over. They will be odd hens at first, but gradually as the months pass a large number will go off laying and fall into moult. When this occurs only a very small percentage will again come on to lay before next spring, and with the present high cost of feeding (about 9d. per hen per month) one cannot afford to keep hens rising three years old on the off-chance that some will come on to lay. It is safe to say that every year there are hundreds of thousands of hens kept in this way through the non-productive period, which should have been marketed many months before. The idea that these hens will come on to lay as soon as they are through the moult is an old fallacy that dies hard. Early moulting of even second-year hens is almost an infallible sign that they are poor producers. It follows then that this class should be closely scrutinised with a view to early marketing; generally speaking, the high producers do not moult until late in the autumn.

Don't make Mistakes.

The novice is very apt to make mistakes in culling out, but, after all, the operation is a simple one as far as old stock is concerned. For instance, feather-eating should not be mistaken for moulting. In the first case the feathers will be fast on the body, but in the case of true moult the feathers become loose and fall out, sometimes profusely, and sometimes more gradually. The slower the moult the better the chance of the hens continuing to lay; hence the hen that never seems to moult, but that is losing a few feathers slowly and growing others at the same time—except in cases of very old hens—is generally the high producer that continues to lay through the autumn, when eggs are high in price. Other indications of continuing to lay are bright red combs that are well out, pliable pelvic bones, and general indications of health. The reverse conditions, and particularly when the pelvic bones become closed and rigid, are indications that laying is suspended for some considerable time.

Keeping too many useless male birds is another way in which the food bill is kept up out of all proportion to necessity.

Yet another unprofitable item is the badly-reared chicken. There are hundreds of thousands of such dragging out an existence in such a way as to constitute them unprofitable stock. It is only by securing good development that we can hope to make our farms profitable, and the attainment of this depends more upon good rearing than on any other factor.

What is Good Development?

It is an easy matter to illustrate what good development is when we have both good and bad before us, but it is more difficult when neither are present. The best indication, however, is weight. If the novice cannot judge size for age, weight will pretty well determine the matter. But here again we have to take into account that there may be but little difference in the weight of, say, White Leghorns and the heavier breeds until after the age of six weeks. A fair to good class of development in early-hatched cockerels would be indicated by the undermentioned weights at different ages :—

6	weeks of age—	Leghorns or heavy breeds	¾ lb. to 1 lb.		
12	,,	,,	2½ lb.,	heavy breeds	... 3 lb.
18	,,	,,	3½ lb.	,, ,,	... 5 lb.
24	,,	,,	5 lb.	,, ,,	... 6 lb.
30	,,	,,	5 lb.	,, ,,	... 7 lb.

It will be noted that the expectation is that weights will be fairly even in both heavy and light breeds up to six weeks, when the heavy breeds should begin to draw away from the light in something like the proportions shown in the table.

It will be noted that little or no gain is expected to take place from twenty-four to thirty weeks in Leghorns, while the increase in weight is expected to continue in the heavy breeds.

These approximated weights are obtainable in chickens hatched between June and 1st September, but not often in chickens hatched after the latter date.

After thirty weeks the birds will, of course, be maturing, and will be expected to have put on ½ lb. to 1 lb. in Leghorns, and 1 lb. to 2 lb. in heavy breeds by the time they are twelve months of age.

Heat Waves.

During the coming months, judging from past experience of drought periods, heat waves of some intensity are to be expected. Generally speaking, great losses among poultry occur at these times through the inexperience of the attendants. Mature stock, and particularly old stock, are the victims. Young stock kept under good conditions rarely succumb to heat. It is principally, therefore, to the older stock that particular attention must be paid. One of the greatest dangers is the tendency of hens to pack into the nest boxes in their attempt to obtain relief; asphyxiation takes place and masses of dead are often found in such places.

Farms with low poultry houses are likely to suffer severely, particularly where there is little shade. On the other hand, a farm that is covered with too much scrub, which prevents the free circulation of air, is likely to suffer to a greater degree than a farm with no shade and good high houses. The latter are of great importance. Although irons roofs are in use, it should be remembered that the higher the roof from the birds the cooler the house. Herein lies the reason why the house, if properly ventilated, is a cooler place than any tree shade can possibly be, particularly if the shade obstructs the free passage of air through the farm. As a matter of fact, tree shade often gives the poultry farmer a false sense of security, and its value is much overrated during the prevalence of severe heat waves. A useful height for narrow houses is 5 feet at the back and 6 feet at the front, and for wider houses, 6 feet at the back and correspondingly higher at the front, according to the width of the house.

Heat Apoplexy *versus* Crop Troubles.

After a heat wave it is customary to hear that many birds were lost from apoplexy. The truth of the matter is that most deaths occur through the fermentation of the morning mash in the crop. What happens is this :—The birds are fed with the mash or have dry mash to feed from, as the case may be. As the heat of the day develops the birds commence to drink the warmed water, fermentation sets in, digestion becomes arrested, the condition of the birds becomes lowered, the crop is distended, causing pressure on the vital organs, and the bird succumbs to a complication of troubles more often than to true heat apoplexy.

What to Do.

On the signs of a severely hot day, it is best to omit from the mash meat concentrates and all substances that are likely to cause fermentation. As a matter of fact, during a heat wave there is nothing better to feed the birds upon than steamed or boiled wheat, leaving out the mash entirely.

The next thing to do is to keep a close watch upon the birds throughout the day, but particularly during the hours of 1 to 6 p.m. Some arrangements should be made whereby the birds that are overcome by the heat can be held under a tap or dipped in water, and then be placed in a shady position where a draught of air can play upon them. The body of the bird ought not to be wholly saturated with water, but only partially wetted; the head, however, should be thoroughly wetted. The wings should be extended and water applied underneath. The birds must be handled with care; rough usage will often cause collapse while in this condition.

Unless productivity can be rapidly increased, there can be nothing but political, moral, and economic chaos [for Europe], finally interpreting itself in loss of life on a scale hitherto undreamed of . . . . During some short period it may be possible for the Western hemisphere, which has retained and even increased its productivity, to supply the deficiencies of Europe. But . . . the entire surplus productivity of the Western hemisphere is totally incapable of meeting the present deficiency in European production if it is long continued."—Herbert C. Hoover, Director-General of Relief, Supreme Economic Council, U.S.A.

Orchard Notes.

DECEMBER.

W. J. ALLEN and W. LE G. BRERETON.

IN many districts the exceedingly dry weather of the spring and early summer has demonstrated the value of early ploughing and of thorough subsequent cultivation. It is hoped that useful falls of rain will crown the results brought about by such sound practice. At the same time, the grower is warned not to relax his efforts in this direction, but is urged to use every means in his power to conserve all the soil moisture possible for the trees by cultivation. In cases where the soil has become trampled down through spraying or other operations, a light ploughing will do better and more lasting work than the cultivator. The plough, too, will often leave the surface in better condition to arrest and soak up any rain that falls. If weeds have sprung up close to the trees and vines that cannot be reached by horse implements, the hand hoes should be set to work.

Dry, hot weather, too, is a favourable time to root out such weeds as couch grass or sorrel. It should be left on the surface to dry and then raked up and burned.

Summer Pruning and Suckering.

The summer thinning of trees and vines should be carried out as it becomes necessary on the different varieties, according to the direction given in these notes earlier in the season; so also must buds and grafts be watched, and suckering carried out, as well as pinching back of shoots from scions if they are extending too rapidly and are in danger of being blown out.

Pests.

In many places the crops of apples and pears are light, and every effort should be made to avoid the crop being further reduced by the ravages of insects, such as codlin moth. See that the regular applications of lead arsenate are made thoroughly, but also, if at all possible, search the trees carefully when the small grubs are first burrowing into the fruit, collecting and destroying all attacked fruit. This is a most effective method of reducing very markedly the later broods. It is often practicable in seasons of light crops, and if the opportunity was always taken advantage of the moth would not be so troublesome during seasons of heavy crops, when such searching becomes in some cases impracticable.

All infected fruit should also be regularly collected and destroyed by boiling or burning.

A close lookout should be kept for San José scale on deciduous trees. In bad cases the trees should be treated with resin-soda wash as soon as the fruit has been harvested, and the trees then marked in order that they may receive more thorough treatment in winter.

It is generally more satisfactory to fumigate citrus for scale during the autumn (April to May), when the hatching of eggs is complete, but where trees are badly infected and there is risk of serious damage being done before then, it is wise to treat them earlier either by spraying or by fumigation, provided the trees are not suffering from lack of moisture. The former should only be done during the cooler parts of the day or on cloudy days, and the latter only at night. Growers who have been using Bordeaux mixture on citrus trees should remember it is not safe to fumigate for several months after.

Drying.

Towards the end of this month the apricots of the inland districts will be fit for drying. For drying, fruit should be thoroughly ripe. Full directions for this work are given in Farmers' Bulletin, No. 52, "Fruit Drying," obtainable from the Department on application.

Specimens of Fruit.

From time to time specimens of fruit for naming are received from growers in different parts of the State. Many of these specimens are submitted without any description of the habit or growth of the trees, or any particulars whatever. It is advisable that those who forward specimens for naming should give a full description of the tree, stating when the fruit ripens, the name (if any) by which the fruit is known in the district, or under which it was supplied by the nurseryman; any other information which may be helpful should also be given. Four or five typical specimens should, of course, always be sent, and the stems should be of average length.

AMERICA'S ATTITUDE TO PEST EXTERMINATION.

THE value in terms of actual dollars which the United States attaches to pest extermination and quarantine was illustrated by Mr. C. L. Marlatt, Chairman of the Federal Horticultural Board, Washington, at the First Interstate Plant Quarantine Conference held at Riverside, California, recently. The pest referred to was the subject of a note in this journal last month.

"One of the newest subjects of quarantine interest," said Mr. Marlatt, "has relation to the European corn [maize] borer which has recently obtained foothold in the neighbourhood of Boston, and in a limited area near Albany, N.Y. We are asking Congress for an appropriation of 500,000 dollars to exterminate this borer, if such a thing is possible. Inasmuch as this insect is known to infest practically all succulent vegetation, even grasses, and is so concealed as to make its discovery difficult, its extermination is not going to be an easy matter; but if it cannot be exterminated it certainly can be controlled. I do not believe in being unnecessarily alarmed over the introduction of any new pest, but this insect has already demonstrated that it has very serious possibilities in relation to the corn crop of America."

Agricultural Bureau of New South Wales.

Suggested Subjects for Bureau Meetings.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion :—

What method do you adopt for classing your wool clip? How many classes do you make, and what distinctions do you observe in the work? What is your practice in branding and baling? Have you found it necessary to amend your methods in this respect in recent years; if so, why?

Have you ever attempted sowing maize or some other quick-growing crop on wheat stubble or fallow land in dry districts by listing (that is, sowing in a deep furrow), without any previous preparation of the soil? What were the results, and for what did you use the crop?

Have you tried, as a means of soil improvement, sowing catch crops, such as cowpeas, velvet beans, &c., among maize, when it is at the present stage of growth? What has been your experience of the effect of this method on the yield of the crops, (a) *of that same year, and* (**b**) *of the subsequent years? Has feeding off such crops given better results in the succeeding crop than ploughing in?*

How far do summer fruits indicate to you that they require cross-pollination? Have you any isolated trees that do better in proximity to other varieties that blossom at the same time? For instance, have you found it necessary to grow other plums for the purpose of fertilising the Japanese plum Satsuma, and what other variety seems best to serve the purpose?

Have you considered the relative merits of the White Leghorn and of the heavier breeds of poultry in respect of the number of chicks that can be reared from a given number of breeding stock in a given time? What has been your experience on the point, and has it affected your practice?

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse the opinions expressed.

Albury.

The monthly meeting of the above branch was held on 23rd October. After the general business of the meeting, Mr. L. S. Harrison, Assistant Inspector of Agriculture, addressed members in connection with the activities of the Agricultural Bureau, and the information and advice given was much appreciated by those present.

Bimbaya.

The monthly meeting was held on 7th October, Mr. G. Alcock presiding. Correspondence was received from the Under Secretary of State Fisheries, advising that five cans of trout fry were being forwarded for liberation in the Tantawanglo River, and arrangements were made for members of the branch to liberate them in the upper reaches of the river.

An interesting discussion took place on the subject of forestry, pursuant to a paper by Mr. L. L. HEFFERNAN. Regret was unanimously expressed that the fine timber of our forests was rapidly being cut out, and members were of opinion that efforts should be made to conserve the remaining areas. One member, Mr. J. R. BOLLER, advocated that before throwing land open for settlement the Government should utilise the best of the timber upon it, even though State sawmills had to be erected, as had been successfully done in Queensland.

Mr. ALCOCK considered that farmers should grow more trees on their farms, and advocated the willow as an excellent shade tree and useful for fodder for stock in times of scarcity.

DEPARTMENTAL NOTE.—The Department has a leaflet on the subject of the willow for stock food and shade, available free on application.

Coradgery.

The monthly meeting of this branch was held on 29th October, when there was a fair attendance of members.

The business of the meeting was the discussion of the water problem. The members decided to ask the Water Conservation and Irrigation Commission to send a boring plant to the district; farmers and settlers are co-operating in the matter.

Coraki.

The monthly meeting of the above branch was held on 21st October, when Mr. W. J. Hodge occupied the chair. There was a good attendance of members.

Several matters in connection with a proposed exhibit for Coraki show were considered, and a quantity of Sudan grass and saccaline seed was distributed amongst members for experiment and for subsequent exhibit of the produce.

The serious drought conditions now prevailing in the locality, and the necessity for providing against such conditions in the future, formed the principal subject of discussion. Silos and silage were considered the best means of provision.

Cordeaux-Goondarin.

At a meeting on 14th August a lecture on spraying was read by the secretary, and proved instructive.

A meeting was held on 9th October, at which there was an attendance of fourteen members. After completion of general business, a discussion took place on a paper on spraying read at the previous meeting.

Cunningham.

A meeting of the above branch was held on 10th October, when there was an attendance of ten members.

An interesting discussion on fallowing took place during the evening, the different aspects of the subject providing a profitable exchange of views.

Dural.

At the last meeting of this branch the members discussed questions which lately appeared in the *Agricultural Gazette.*

The testimony was given that Japanese plums sprayed consistently in July with lime-sulphur were quite free from disease. One large grower said he used lime-sulphur and arsenate of lead for apples. Burgundy mixture has been used in the district with considerable success in the control of black spot in pears, being applied in conjunction with the arsenate of lead spray.

Garra-Pinecliffe.

A meeting of the above branch was held at Mr. H. Robard's residence on 9th October, there being a fair attendance of members.

The main business of the meeting was an address given by Mr. L. S. Harrison, Assistant Inspector of Agriculture. Amongst other suggestions, Mr. Harrison proposed that a question box be kept and that each member write a question on a piece of paper, which would be placed in the box and drawn out at random, each member to speak on the question drawn by him. Mr. Harrison answered a number of questions, and was accorded a hearty vote of thanks.

March.

A meeting of this branch was held on 20th October, when a paper was read on diseases of fruit trees and necessary spraying. The writer particularly referred to the necessity for a spreader in conjunction with the lead arsenate spray for codlin moth, and advocated adding 2 lb. of flour to each 40 gallons of spray, as the lead arsenate had a tendency to run together in drops.

DEPARTMENTAL NOTE.—The Fruit Expert remarks that though flour paste and size gave very promising results as spreaders a couple of seasons ago, last season, which was very dry, soap gave by far the best results. Attention may be drawn to the fact that laboratory tests by the Chemist of this Department show that a chemical reaction takes place between lead arsenate and soap, and until field tests have gone further soap should be used with great caution and in a small trial way.

Milbrulong.

The annual meeting of this branch was held on 10th October, when there was a representative gathering.

The balance-sheet was read and adopted, there being a credit of £1 11s. The following office-bearers were elected:—Chairman, Mr. J. Lynch; Vice-Chairmen, Messrs. O. Stickels and W. Mackaway; Hon. Secretary and Treasurer, Mr. J. M. Gollasch, H.D.A.

A debate on "Hay-making *versus* Wheat for Grain" has been fixed for next meeting.

Miranda.

A meeting of the members of this branch was held on 23rd September, when Mr. Potts, Principal of Hawkesbury Agricultural College, gave an address on pig-raising on small areas.

Mr. Potts said he knew no farm stock that would give a larger return for such a small outlay as pigs; everything that the pig required could be produced on the farm, all waste products could be advantageously fed, and even waste grain that was unfit for the horse could be boiled and utilised. Denmark had, by organisation and co-operation, lifted herself out of a state of starvation and had become one of the most productive nations for its size in the world, and pig-raising had helped considerably towards that end. Pigs fed on lucerne, cowpeas, rape, barley, pumpkin and mangolds, with skim milk, pollard and salt, said Mr. Potts, should put on 1 lb. in weight per day and should be ready for market in four months. Berkshire and Middle Yorks were dual-purpose pigs, the Poland China should be used for porkers, while Tamworth made the best bacon in the world.

In speaking of the ailments of pigs, the lecturer said it was of the utmost importance that the excrement should be closely watched. If it was hard and of dark colour, something was wrong with the digestion, and the use of castor-oil was advisable; but if light or yellow, the liver was at fault, and Epsom salts should be used in order to increase the flow of bile.

After the lecture many questions were asked. Replying to that of Mr. Buckland as to how to detect tuberculosis, Mr. Potts said that if the disease was taken from the air, the pig would run at the nose, mouth and eyes; if in the food, it took the form of wasting and diarrhœa. The cause of paralysis in the hind quarters was no doubt too close breeding; it argued that a change of boar was advisable.

A meeting of the members of this branch was held on 7th October, when it was decided to make the second Annual Farms Competition (Poultry), commencing 1st Janaury, 1920, open to all poultry farmers in the shire of Sutherland having not less than 450 head of adult stock. The conditions and points were decided upon. Mr. T. J. Ley, M.L.A., has again kindly consented to donate the trophy.

Mittagong.

The annual meeting of this branch was held on 13th September. Following the discussion of correspondence, the balance-sheet for the year was presented and adopted. The officers elected for the ensuing year were as follows:—Chairman, Mr. C. Riley; Vice-Chairman, Mr. A. J. Turner.

It was decided to transfer the banking account of the branch to the names of the chairman and secretary, and to grant to the secretary an honorarium of one guinea. It was agreed to place on record an appreciation of the services of Captain Fairley, late chairman.

Moss Vale.

On 10th October Mr. J. A. Porter, of Camden, gave an interesting address on dairying to members of this branch. He said the present high price of fodder should be a lesson to farmers who were catering for the grain market only and neglecting the question of fodder reserves. For dairy purposes he preferred the larger types of cattle—Holsteins and Durhams. The Durham crossed with the Ayrshire gave very satisfactory results. Both breeds required heavy feeding, while the Ayrshire would thrive where others failed, though it was not such a kindly breed as the two first mentioned. He recommended the cultivation of feed crops and the making of maize and sorghum silage and of wheaten and oaten hay.

Nimbin.

Mr. H. Wenholz, B.Sc., delivered a lecture before this branch on 8th November.

Lecture on Maize Growing.

The work of the Department in maize improvement was first described, and also the successful efforts in the production of pure seed for distribution. At each Government farm only one variety was grown so that the seed might be kept pure, though at Grafton Experiment Farm, owing to the long season, it was possible to grow two varieties—Leaming and Improved Yellow Dent—and to retain their purity by planting one early in the season and the other late, so that there was no danger of intercrossing. Both these varieties could be confidently recommended for this district for grain, and the latter—Improved Yellow Dent—was also the best variety known on the North Coast for green fodder, producing the greatest weight of succulent growth, with sweet and thin stalks. Sowing for green fodder was recommended in drills about 3 feet apart with single grains about every 6 or 8 inches, using about 25 lb. seed per acre. This heavy seeding had been found to give the highest yields of fodder, and the growth of thin succulent stalks ensured very little waste when cut and fed to cattle. Farmers in the district were advised strongly to go in for this variety until a better one was found—if that were possible. Being largely a dairying district, fodder was of most importance, and they had the satisfaction also of knowing that this variety was a very good grain yielder if grown for that purpose. To avoid bringing seed from Grafton, farmers should consider the advisability of establishing pure seed plots with reliable growers in the district, who could be depended on to supply a first-class sample for sale. They would thus have the advantage of having the seed acclimatised and better yields would result.

As regards the preparation of the soil, deep, early ploughing laid a solid foundation for a successful crop. On rich land the preliminary preparation should consist of two or three ploughings—the first as deep as possible, and later ploughings shallower. The first ploughing should begin as early as possible in winter, and the land then be allowed to lie roughly, so as to get the benefit of whatever frosts and rains occurred. It was urged that with a good fallow for storing moisture it would be possible to get away from the popular belief that rain was necessary at tasselling to ensure a successful crop. It might be granted that rain at this time was beneficial, but with better methods of storing and conserving moisture, it was possible to be to a large extent independent of that rainfall. The use of the roller was dealt with, the speaker holding the view that far too much use was made of that implement under ordinary conditions. No amount of theoretical argument or field practice could defend the use of the roller on wet land or leaving a rolled surface in spring or summer, when evaporation was going on rapidly. It was true that under certain conditions the roller was almost absolutely necessary, but many of such conditions could be avoided. The ideal condition for a seed bed for maize were a firm subsurface and a loose surface. This could only be accomplished by following the roller with a harrow, or by the use of the disc harrow, which combined the effect of these two implements in one. A reversible disc harrow, which could be turned into a cultivator, and whose frame could be raised 2 or 3 feet to straddle the rows, was undoubtedly the most useful and economical implement on the maize farm of to-day. Several types of this instrument were now on the market.

The greatest trouble with maize growing on older soils was undoubtedly the keeping down of weeds—but they might be a blessing in disguise, for they compelled farmers to use thorough methods in cultivation. The most troublesome weeds were those in the rows with the maize, and the combined use of the harrow on the young crop, and later the disc cultivator, was the most successful means of getting rid of these. To a large extent the planting of maize in furrows which were gradually filled in by cultivation smothered these weeds, but harrowing the growing maize when about 4 to 6 inches high would be found to destroy a good crop of weeds and to have a beneficial effect in aerating the soil and conserving moisture in a quick and efficient manner. Several precautions were necessary when harrowing growing maize, the chief being to keep the harrows clean and free from rubbish, which did the most harm in tearing plants out.

Green manuring with leguminous crops like cowpeas, peas and vetches, sown in the maize crop about the time of the last cultivation, was strongly recommended as a means of bringing the land back to some of its virgin fertility. The difference between new and old cultivated soils was due most largely to the loss of organic matter, which was converted into plant food by cultivation. Some attempt should be made to maintain this organic matter if high maize yields were to be expected. There was every possibility of the fertility of the soil being increased, or at least maintained, with this system of green manuring with leguminous catch crops, without losing a crop of maize. But the time to begin was now at hand, for it was an expensive and laborious process to bring land back to productiveness once the depletion of fertility had gone too far.

As regards fertilisers, it was considered that phosphates alone were required on maize soils in this district, and they would be well advised to apply 2 cwt. per acre of a mixture of equal parts of superphosphate and bonedust. This mixture had given surprising results in experiments along the whole length of the coast.

The keeping of seed maize by fumigation was touched upon. Carbon bisulphide was recommended as a cheap and efficient means of saving seed from weevils and grain moth, 1 or 2 oz. being sufficient to fumigate 5 or 6 bushels of maize on the cob, at a cost of 1d. or 2d.

Orangeville.

The monthly meeting of this branch was held on 27th October.

The question how best to stimulate attendance at the meetings was discussed, and it was decided to ask that Mr. L. S. Harrison, Assistant Inspector of Agriculture, should visit the district with a view to reorganising the branch.

Penrose-Kareela.

The monthly meeting of this branch was held on 13th September, when there was an attendance of twelve members.

The question of treatment of black spot on apples and pears was discussed, the following being a summary of the conclusions arrived at :—

1. Lime-sulphur is the best means of treatment.
2. Some preparation with better lasting power is badly needed, especially in a wet season.
3. The best time to spray is first when the buds are pinking, again in conjunction with the first arsenate of lead spray, and thereafter when necessary, according to the amount of spot showing.

DEPARTMENTAL NOTE.—The Fruit Expert states that he has found lime-sulphur much safer to use than Bordeaux mixture, because of the liability of the latter to russet and depreciate the value of the fruit. Experiments carried out at Penrose by the Department over a period of two to three years indicated that lime-sulphur would control black spot, and later this result was confirmed. Further data will be obtained from experiments which are being continued at Penrose and Batlow, and also at Glen Innes and Bathurst experiment farms.

Springside.

A meeting of this branch was held on 7th October, when there was an attendance of twenty-nine members. Papers entitled "The Orchard" and "The Value of the Agricultural Bureau" were read by Messrs. John Selwood and E. H. Selwood respectively.

THE ORCHARD.

The fruit-growing industry was on a better basis to-day than thirty years ago, both as regards quality of product and productive area, said Mr. J. SELWOOD. Intending planters should take care, however, to select suitable varieties, especially of apples and pears. A phase of the industry that had not yet been seriously considered in the district was the production of canning and drying varieties; in this direction he thought better profits awaited growers than in marketing fresh fruit.

The fruitgrower would find that his orchard required plenty of attention right from the time of planting. One of the worst pests in his experience was the elephant beetle, which he personally dealt with by covering the trees while small with a hood made of chaff bags; when the trees became larger, however, the ideal remedy was the turkey. Perhaps the very worst orchard pest was woolly aphis, for which, in his opinion, no really satisfactory remedy had yet been discovered.

THE VALUE OF THE AGRICULTURAL BUREAU.

In times past, said Mr. E. H. SELWOOD, in introducing this subject, excellent crops had been obtained by indifferent methods of cultivation. With decrease in crops, the situation had at first been met by simply moving on to fresher areas, but other farmers having reached exactly the same position, this method of dealing with the position perforce became impracticable. It was at this juncture that the farmer first began to take a more favourable view of the suggestions of scientific agriculture. Hitherto he had been prone to regard the man of science with reservation, considering that he could get more profitable crops in his own way. The change had come, however, and science was now making suggestions which the practical agriculturist was applying. The Bureau was one means by which the suggestions of science were brought under the notice of farmers. It was one of the agents by which the latest discoveries and improvements were quickly and widely made known to primary producers.

One of the educational effects of the Bureau was to help the farmer to realise his relationship to the rest of the community, which community as a whole has helped to increase the value of his land, the mere fact that population was increasing having brought roads, railways and markets closer to his doors.

The Bureau also sought to reach the farmer in his social life, and to provide opportunities for him to meet his neighbours, with mutual pleasure as well as profit.

St. John's Park.

A demonstration was given by Mr. H. E. Laffer, Viticultural Expert, at Mr. Gava's vineyard on 17th October. It was largely attended by interested members of this branch.

Stratford.

A very successful demonstration of land clearing with explosives was given on 14th October by Mr. C. W. Burrows, Field Assistant, about seventy spectators being present. The method of treating timber with explosives was carefully explained and the handling of explosives with safety clearly demonstrated.

At a meeting on 4th October a paper on New South Wales hardwoods was read by Mr. J. P. Shedden. A summary of the paper follows :—

The Hardwoods of New South Wales.

Concerning the lasting quality of any timber, said Mr. **Shedden**, the variety that would, in his opinion, last longest in any district would be the predominating one in that district. If, for instance, white mahogany predominated in a certain locality it would quite easily outlast any other timber introduced into a fence in that particular vicinity.

Narrow-leafed gum was a splendid lasting timber in the ground, and if it predominated in any locality it would be useless to introduce white mahogany or any other timber and expect it to last like the gum. He was of the opinion that the lasting qualities of timber were controlled by the soil; and if a tree were found to be plentiful in a certain soil, that would be the best timber to use in ground work, such as fencing posts and house blocks. Seasoned timber would also outlast timber erected full of sap and heartwood.

There were many people who condemned a certain class of timber for all purposes. because they had found it unsuitable for any particular purpose. This was a mistaken principle—all timbers would be found useful in some way.

Ironbark was much used for sleepers for both local and oversea railways, with excellent results, but sleepers should also be cut from other hardwoods, and ironbark conserved. According to Government tests, New South Wales ironbark would stand a greater pressure than any other timber, and made the best girder in the world. Ironbark girders were now preferred to steel for large buildings, warehouses, &c., for the reason that fire would only char it, and it might be extinguished, while heat would cause the steel girder to buckle and draw the whole building with it.

Grey gum was almost on a par with ironbark, and in the speaker's opinion should be more freely used to relieve the latter for construction work. Being susceptible to white ants, it was of no use for ground work. Tallow-wood was unequalled for railway carriage-building, was also excellent for floors, and stood exposure above ground to weather conditions. Red mahogany, much prized for its strength and durability, was used for ships' knees, shingles, posts, &c., and general building and furniture purposes. It was a wood that dressed and polished well, making an ideal rusticated board. Rafters of this timber remained in a perfect state of preservation after fifty years' service. White mahogany was strong and durable, and made good sleepers, flooring boards, slabs, rails and fence posts. Palings of it would not warp when exposed to the sun, and for longevity in ground work it was one of the best.

A wood much used for posts, rails, building and fuel was stringybark; it was strong and durable, and made excellent roofing material. Spotted gum was hard and tough, exceedingly durable, and did not warp; it was much esteemed by wheelwrights for spokes, and was used also for ship and boat building. When free from sap spotted gum was a good all-round timber, and should be more generally used for heavy work. It gave good service for axe and other handles. Another timber of good repute for fence rails and slabs was blue gum. It did not readily take fire; it lasted well, and was excellent for ship-building and the making of felloes.

A timber much prized for its great strength and durable qualities was brush box, in popular demand for ship-building; ribs of vessels of brush box had remained unimpaired after thirty years of service. It was also white ant resistant, and was used in the construction of wharves and bridges. This timber made excellent frames for a cottage if protected from the weather, and would last a lifetime as far as white ants were concerned.

Another valuable timber for piles, wharf sheeting and fencing purposes was turpentine. It was very durable in the ground, and, owing to its resinous matter, would resist damp and the white ant and teredo. It was used for ship building, but it was soft and brittle and warped in the sun. It did not burn readily, but only charred, and for this reason made good railway sleepers. Piles of it were obtained up to 100 feet long. On account of its fire-resistant quality and durability, it was one of the good woods for fencing purposes. He recalled once coming across a turpentine log that had been blown down, the sap of which had entirely rotted away, but the timber of which was as sound and red as on the day it fell—from the appearance of the ground not less than fifty years earlier.

His choice of timber for house building, said Mr. Shedden, would be as follow:—Brush box for frame, red mahogany for weatherboards and lining, tallow-wood for floors, and turpentine for fencing.

DEPARTMENTAL NOTE.—The theory that the timber predominating in a given locality is the one that in that locality will last the longest is an interesting one, though open to debate. Perhaps other members of the Bureau will express an opinion on it.

Tingha.

A demonstration of planting and pruning a young tree was given by **Mr. W.** le **G.** Brereton, Assistant Fruit Expert, before the members of this branch on 23rd July. Mr. Brereton's remarks are summarised as follows:—

PLANTING AND PRUNING A YOUNG TREE.

The first point in planting was to have the land prepared by ploughing and subsoiling, so that the soil was well stirred to a depth of 18 inches and soft, well-broken soil provided through which the roots could speedily make their way. If holes only were dug where the trees were to be planted, there was a danger that in wet weather they would act as drains to collect the water, thus prejudicially affecting the young trees. It was therefore advisable to work the whole of the plot.

The ground next required to be marked out in even rows. For this purpose a wire with buttons soldered on at the required distances between the trees was used. This was stretched into place, the holes dug, and the trees planted, and the wire then lifted to the next parallel position. Another method was to double peg and use a planting board with a V-shaped notch in the middle to give the exact position of the tree. With the marked wire method, trees were planted direct and pegs only used to mark the base lines; but whatever method was used it was necessary to have the trees evenly spaced in regular rows, so that the soil could be easily worked.

In digging the hole it was necessary to have it sufficiently wide to allow the roots to be spread out, otherwise they would be crumpled and twisted up. After loosening the soil in the bottom of the hole, a little of the top soil was placed in it and drawn up in the centre, all bruised, broken, or diseased roots cut off the tree, any long ones shortened back, and the tree placed in the hole at about a similar depth to its original one in the nursery. It was a good plan to brace the tree by placing the strongest root against the prevailing wind. The roots should be given a downward tendency and spread carefully out. Owing to the closeness in which the young trees are grown in the nursery, it was sometimes found that the roots had not developed evenly all round, and it was then necessary to lead the roots into the required positions. When two layers of roots were observed, soil should be worked in between, so that each root would have a separate hold of the soil. This might take a little longer, but just as a good foundation was necessary when building a house, so was a proper start required in order to develop a profitable fruit tree. The final procedure was to fill in with moist soil, ramming it well under the crown of the roots and making it firm by tramping. In dry weather a basin-like hollow should be left and two buckets of water poured in, the rest of the soil being filled in loosely when the water had soaked away. If very dry, a mulching of bush scrapings, horse-bedding, &c., should be spread round the young trees, but no manure should be placed in contact with the stem of the tree, or there would be a danger of scalding.

In very poor soils it was found that some fertiliser, such as bonedust or stable manure, had to be worked in, in order to give the trees a start, but in soils of average fertility it was not desirable.

As some of the roots had been cut away, there would not be enough to provide nourishment for all the top, and consequently it also had to be pruned. If the top growth were scanty it was best to cut back fairly hard, but if showing signs of sturdy. vigorous growth, not so far back. As the first step was to obtain good limbs as a foundation for the tree, the cutting should be to those buds best situated to give limbs where required. The old method had been to start the tree fairly high, but about 1 foot 3 inches to 1 foot 6 inches was now regarded as the height most suitable, though in hot dry climates they were headed much lower even than that in order to shade the stem from the hot sun and burning winds. At this point a caution was necessary: two limbs should never be started from the same position, as there was a big danger of splitting. The old objection to low heading was that it made it more difficult to work the ground around, but this was to a large extent obviated by the use of the orchard plough, which had swivel handles and enabled the plough to work close in.

The pruning demonstration which took place subsequently was keenly followed by a number of orchardists, several representative trees being treated.

Master Cecil Schuman thanked Mr. Brereton for his demonstration to the boys, and in his reply Mr. Brereton expressed his pleasure at being able to visit Tingha and assist them. He was very pleased with the interest they had shown.

Toronto.

An interesting and largely attended demonstration on citrus pruning and summer pruning of young peach trees was given by Mr. W. le Gay Brereton, in Mr. G. Froome's orchard, Cary Bay, on 14th October.

A number of trees were pruned—(1) a number of orange trees; (2) two lemon trees, a good deal of wood being taken out in this case; and (3) a mandarin tree—one that had suffered a big set-back from drought and red scale being cut well back by Mr. Brereton in order to re-shape it. The demonstration was concluded by the summer pruning of several young peach trees which were planted last season.

A hearty vote of thanks was accorded Mr. Brereton, the gratifying fact being referred to that in three years the membership of the branch had increased from eight to thirty-five. A vote of thanks was also accorded Mr. G. Froome for the use of his orchard.

Departmental Note.—In regard to this demonstration Mr. W. Le Gay Brereton, Assistant Fruit Expert, comments as follows on the three operations specifically referred to:—(1) The orange trees dealt with were well shaped and well grown and required very little to be done to them. Later, as the wall of foliage increases, the small growth in the interior of the tree will become spent and should be removed, but in the present condition of the tree, if not overcrowded, it will not only crop but will provide shelter to the limbs from both sun and wind. (2) More cutting was necessary in the case of the lemon trees dealt with, because there were in each case several strong shoots growing up through the tree and interfering with its main limbs. The lemons were the Sweet Rind variety, which are better for some topping back during their first year's growth, as otherwise their main branches extend too fast, cropping on the ends and breaking down. (3) It should be understood that this was not a regular treatment of this tree, but it was proper in this case (owing to the state of the tree through causes mentioned) to cut back and re-start it.

Walla Walla.

Mr. J. W. Mathews, Sheep and Wool Expert, visited this branch on 6th October. About forty farmers attended the afternoon demonstration at Mr. E. G. Wencke's woolshed and were keenly interested. A large gathering collected at the hall for the lantern lecture in the evening. Some of the farmers who thought they had very little more to learn in the matters dealt with, freely expressed the opinion that the information was an "eye-opener" to them.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	A. Buchhorn, Albury.
Baan Baa	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bankstown	J. W. Cunningham, Brancourt avenue, Bankstown.
Bathurst	J. McIntyre, Orton Park.
Batlow	A. C. Arnot, Batlow.
Beckom	H. Horsburg, Beckom.
Bimbaya	J. B. Boller, Tantawanglo.
Blacktown	B. H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell).	C. A. McAlister, Bloom Hill, O'Connell.
Bobin	Chas. Pfeiffer, P.O., Marlee, via Wingham
Borambil	H. A. D. Crossman, "Homewood," Quirindi.
Braidwood	A. Page, Braidwood.
Brocklesby	J. Hunter, Brocklesby.
Buckaroo	P. J. Crowley, Buckaroo.
Bungalong	G. H. Pereira, Grenfell Rd., via Cowra.
Canadian Lead	F. W. Taylor, Canadian Lead.
Cardiff	A. Barratt, Cardiff.
Carlingford	F. H. Harvey, Ray Road, Epping.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Clovass	W. G. Cox, Tatham.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Rowcliff, Cow Plain, Collie.
Comboyne	J. J. Dolton, Comboyne.
Coonabarabran	H. H. Moss, Coonabarabran.
Coradgery	M. J. Kelk, Back Trundle Road, Parkes.
Coraki	G. A. Forrest, Coraki.
Cordeaux-Goondarin.	F. A. March, Cordeaux River, Mount Kembla.
Coreen-Burraja	—
Corowa	R. Dwyer, Corowa.
Cotta Walla	T. A. Howard, Cotta Walla, Crookwell.
Crudine	F. W. Clarke, Crudine.
Cumnock	K. J. Abernethy, Cumnock.
Cundletown	S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla.	J. D. Berney, Eurimbla, via Cumnock.
Cunningham	B. J. Stocks, Linden Hills, P.O., Cunningham.
Deniliquin	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	Geo. Turvey, Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Eulomogo	J. H. Stinson; Eulomogo.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook	W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	W. Thompson, Forest Ck., Frogmore
Garra & Pinecliff	S. W. Packham, "Clifton," Pinecliff.
Gerringong	J. Miller, Warrabank, Toolijooa.
Glenorie	J. Hutchinson, Cattai Rd., Glenorie.
Grenfell	A. A. Patterson (*pro tem.*), Grenfell.
Gunning	E. H. Turner, Gunning.
Hay	F. Headon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
Hillston	M. Knechtli, Hillston.
Holbrook	Frank F. Forster, Holbrook.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jilliby-Dooralong	K. A. Smith, Jilliby, Wyong.
Jindabyne	Sylvester Kennedy, Jindabyne.
Keepit (Manilla)	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	J. M. Firth, Kellyville.
Kyogle	J. Martin, Kyogle.
Leech's Gully	James Donnelly, Leech's Gully.
Leeton	W. J. Monfries, Farm 521, Leeton.
Lidcombe	H. Laman, Martin-st., Lidcombe.
Lisarow	A. L. Kelman, Lisarow.
Little Plain	F. S. Stening, Little Plain, via Inverell.
Lower Portland	H. Hayward, Lower Portland.
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham	A. E. Caldwell, Erina.
Meadow Flat	T. L Williams, Meadow Flat, via Rydal.
Middle Dural	A. E. Best, "Elliceleigh," Dural
Milbrulong	F. W. Gollasch (*pro tem.*), Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Miranda	A. C. Wigzell, Sutherland.
Mittagong	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya.
Moss Vale	W. G. Bale, Moss Vale.
Narellan	G. J. Richardson, Narellan.
Narrandera	James Faulkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains.
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville	W. J. Angilley, Orangeville, The Oaks.
Orchard Hills (Penrith).	K. Basedow, Orchard Hills, via Penrith.
Parkesbourne	S. W. McAlister, Parkesbourne.
Peak Hill	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	C. Aye, Penrose.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue)	E. Miskle, P.O., Lue.
Quaker's Hill	C. Gardner, Blacktown.
Rawsonville	G. R. J. Hovenden, Rawsonville.
Redbank	J. J. Cunningham, Redbank, Laggan.
Ringwood	Wm. Tait, Ringwood.
Robert's Creek	J. W. Morrissey, Robert's Creek.
St. Marys	W. Morris, Queen-st., St. Marys.
Sackville	Arthur Manning, Sackville.
Sherwood	J. E. Davis, Sherwood.
Speedwell (W. Wyalong).	B. Noonan, Speedwell, W Wyalong
Spencer	H. J. Woodbury, Spencer.
Springside (via Orange).	W. P. Scarr, Springside.
Stockinbingal	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Stratford	P H. Deards, "Loch Maree," Stratford.
Tallawang	Selwyn E. Hinder, Tallawang.
Tallong	—
Tangmangaroo	A. Thompson, Kangiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, "Chacewater," Chellington, Temora.
Tennyson (North Richmond).	H. C. Croft, Kurrajong.
Thyra-Bunaloo	C. H. M. Smith (*pro tem.*), Thyra, via Moama.
Tingha	M. L. Levitt, Tingha.
Toronto	J. Froome, Knowle Farm, Toronto.
Ulan	P. S. D. Howarth, Ulan, near Mudgee.
United Peel Riv. (Woolomin).	C. J. MacRae, Woolomin.
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	E. Crouch, "Estella," Wagga.
Walla Walla	H. Smith, Walla Walla.
Wallendbeen	W. J. Cartright, Wallendbeen.
Walli	C. T. Allen, Walli.
Warner's Bay and District.	J. Raw, Fairfax-st., Spiers' Point.
Wellington	L Jurd, Warne-st., Wellington.
Wetherill Park	A. J. Hedges, Wetherill Park.
Windsor	W. H. Spinks, Windsor.
Wollun	J. B. Anderson, Wollun.
Wolseley Park	L. M. Evans, Wolseley Park.
Woonona	H. Coltman, Woonona
Wyan	—
Wyong	Edgar J. Johns, Wyong.
Yass	C. N. Howard, Yass.
Yarramalong	E. Hodges, Yarramalong.
Yetholme	—
Yurrunga & Avoca	M. Spain, voca P.O.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1920.

Society.	Secretary.	Date.
Kiama A. Society	G. A. Somerville	Jan. 24, 26
Nimbin A. and I. Society	B. R. Southwell	,, 27, 28
Gosford and Brisbane Water A. and H. Association (Gosford).	H. G. Parry	,, 30, 31
Berry A. Association	W. Pryor	Feb. 4, 5
Tweed River A. Society	T. M. Kennedy	,, 4, 5
Central Cumberland A. and H. Association.	H. A. Best	,, 13, 14
Ulladulla A. and H. Association (Milton)	R. F. Cork	,, 18, 19
Dapto A. and H. Society	F. James	,, 20, 21
Wyong District A. Association	C. N. Walters	,, 21, 22
Alstonville A. Society	C. D. McIntyre	,, 24, 25
Inverell P. and A. Association	J. T. Dale	,, 24, 25, 26
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 24, 25, 26
Dorrigo and Guy Fawkes A. Association	R. R. Blair	,, 25, 26
Newcastle A., H., and I. Association	E. J. Dann	,, 25, 26, 27, and 28.
Yanco Irrigation Area A. Society	R. Tribe	Mar. 2, 3
Tenterfield P., A., and M. Society	E. W. Whereat	,, 2, 3 4
Tumut A. Association	T. E. Wilkinson	,, 3, 4
Manning River A. and H. Association (Taree)	L. Plumer	,, 4, 5
Berrima District A., H., and I. Society	C. E. Wynne	, 4, 5, 6
Wollongong A., H., and I. Association	W. J. Cochrane	,, 4, 5, 6
Nepean District A., H., and I. Society	C. J. Welch	,, 5, 6
Bangalow A. and I. Society	W. H. Reading	,, 9, 10
Mudgee A., P., H., and I. Association	E. J. Hannan	,, 9, 10, 11
Gundagai P. and A. Society	H. W. Simpson	,, 10, 11
Moruya A. and P. Society	H. P. Jeffery	,, 10, 11
Tumbarumba A. Association	W. R. Figures	,, 10, 11
Hunter River A. and H. Association (West Maitland)	E. H. Fountain	,, 10, 11, 12, and 13.
Armidale and N.E. P., A., and H. Association	A. McArthur	,, 16, 17, 18, and 19.
Cobargo A., P., and H. Society	T. Kennelly	,, 17, 18
Macleay A., H., and I. Association	E. Weeks	,, 17, 18, 19
Camden A., H., and I. Society	A. E. Baldock	,, 18, 19, 20
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 24, 25
Walcha P. and A. Association	S. Hargrave	,, 24, 25
Royal Agricultural Society of N.S.W.	H. M. Somer	March 29 to April 7.
Batlow A. Society	C. S. Gregory	April 13, 14
Bathurst A., H., and P. Society	S. V. Turrell	,, 14, 15
Upper Manning A. and H. Association (Wingham)	D. Stewart	,, 21, 22
Dungog A. and H. Association	W. H. Green	,, 28, 29, 30
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	Aug. 24, 25, 26
Lockhart A. and P. Society	E. D. Arnold	,, 31, and Sept. 1
Northern A. Society (Singleton)	J. T. McMahon	Sept. 15, 16, and 17.
Temora P., A., H., and I. Association	A. D. Ness	,, 21, 22, 23
Junee P., A., and I. Association	T. C. Humphreys	,, 28, 29
Holbrook P., A., and H. Society	J. S. Stewart	,, 28, 29

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